

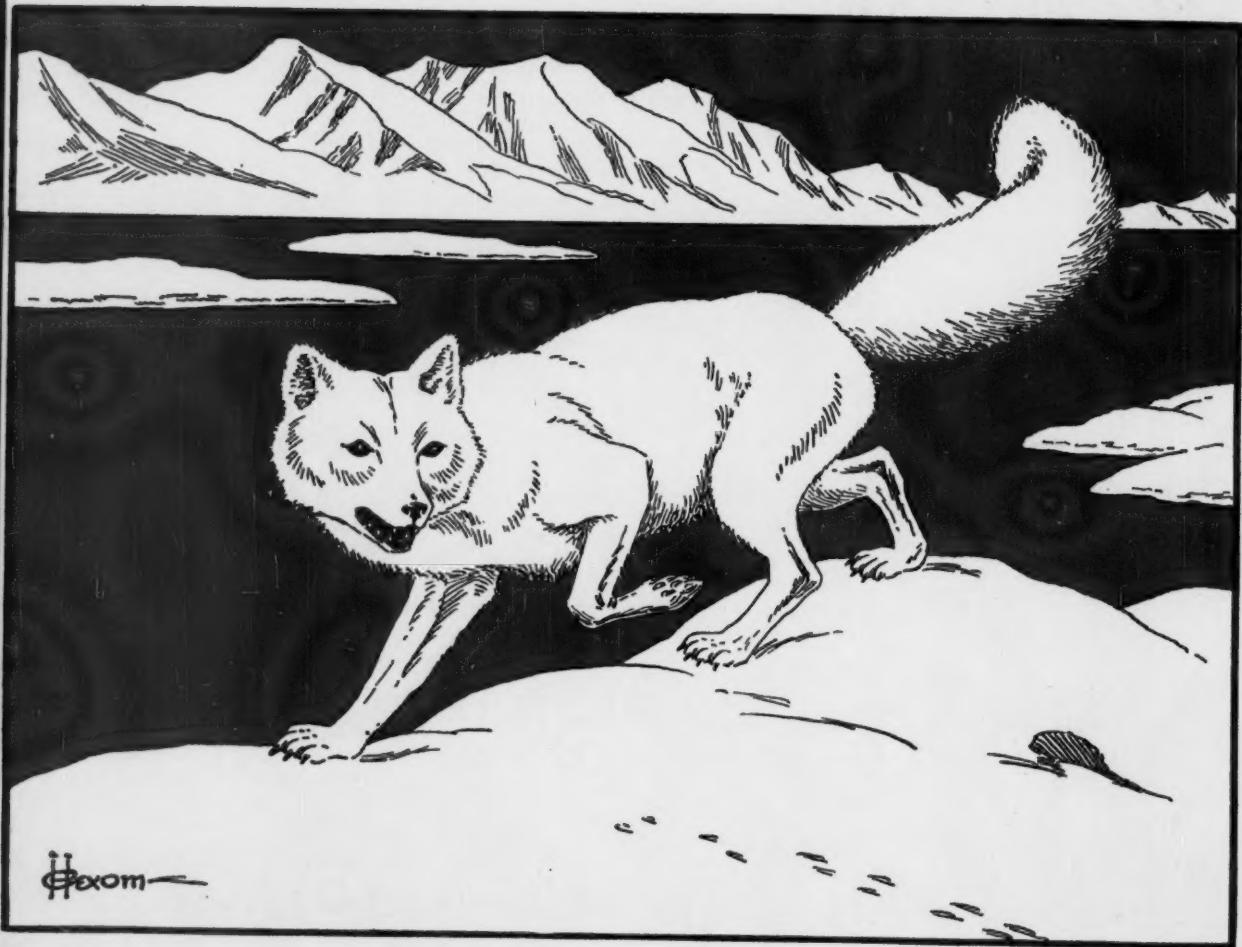
# Nature Magazine

APRIL

1959

VOLUME 52 NUMBER 4

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## Reviews

### The Amazing Book of Birds

By Hilda Simon. New York. 1958. Hart Publishing Co. 128 pages. Illustrated by the author. \$3.75.

This book seeks to introduce the younger reader to an interest in birds by stressing the unusual in bird life and habits. In accomplishing the objective the author-illustrator has divided the book into chapters dealing with the equipment of birds, nest and eggs, how birds fly, bird migration, exceptional birds, how birds get food, odd ways of birds and birds of the past.

### Weather

Weather in Your Life. By Irving Adler. New York. 1959. The John Day Company. 126 pages. Illustrated. \$3.00.

The Real Book about the Weather. By Frank H. Forrester. Garden City, N. Y. 1958. Doubleday and Co. 218 pages. Illustrated. \$1.95.

Coming to hand almost simultaneously, these two popularly written books on the weather should be considered together. Irving Adler's book is directed toward an audience that the publisher designates as "ages 12 up." If we may judge by the general lay ignorance of weather and what makes it, the "up" seems specially advisable and non-limiting. He writes an introduction to meteorology that will be useful to all whose weather knowledge is limited to what they read in the upper left hand corner of page one in the newspaper. Frank Forrester's book, which is one in the "Real Book" series from this publisher, goes into more detail but is completely popular in treatment. It seems equally valuable to the "ages 12 up" group. We can commend both books as adding to public understanding of the vagaries of weather. R.W.W.

### Forests

The Living Forest. By Jack McCormick. New York. 1959. Harper Brothers. 127 pages. Illustrated. \$3.95.

Green Power. By James Stevens. Seattle. 1958. Superior Publishing Co. 95 pages. Illustrated. \$3.00.

Here are two interesting new books on the forest. *The Living Forest* draws its inspiration from the magnificent new Hall of North American Forests at the American Museum of

Natural History in New York. The exhibits in this Hall, while seemingly static behind their almost invisible glass fronts, are teeming with the life of the forest and eloquent of the lessons of the forest. Mr. McCormick has effectively transposed the story of the Hall of Forests into book form. *Green Power* is an excellent extension of Mr. McCormick's book. It deals with lumbering in the Northwest, with the gradual exhaustion of the forests of the Olympic Peninsula, with its correlative economic impact on communities there, and with the passage of Public Law 273, which came to the rescue of families and communities dependent on the forests. This is a personal experience story and a record of a period and circumstance in our history that is of primary importance. R.W.W.

### Briefly Noted

Your Vocational Adventure. By Jesse C. Burt. New York. 1958. Abingdon Press. 203 pages. \$2.95. Advice on choosing a vocation and evaluating one's aptitudes for a chosen calling.

A Hive of Bees. By John Crompton. Garden City, N. Y. 1958. Doubleday and Co. 180 pages. \$3.75. The life of the bee, inside and outside the hive.

Explorations East of the High Andes. By Victor Oppenheim. New York. 1958. Pageant Press. 267 pages. Illustrated. \$5.00. Scientific study and adventure from Patagonia to the Amazon.

Water, Riches or Ruin. By Helen Bauer. Garden City, N. Y. 1959. Doubleday and Co. 121 pages. Illustrated. \$3.00. A book about the significance of water. For the younger reader.

A Clear Water Stream. By Henry Williamson. New York. 1959. Ives Washburn, Inc. 229 pages. \$3.50. Another delightful book of the outdoors by this noted British author.

Feast of the Midnight Sun. By J. David Ford. New York. 1958. Greenwich Book Publishers. 94 pages. \$2.75. A tale of the Canadian Arctic and dramatization of the Feast of the Midnight Sun.

Pocket Field Guide to Animal Tracks. Harrisburg, Pa. 1958. The Stackpole Co. \$1.50. Simple guide to tracks of 28 smaller mammals and 16 larger ones.

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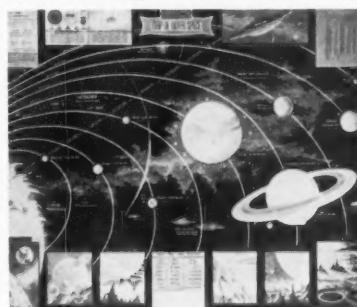


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APRIL, 1959 VOL. 52 NO. 4

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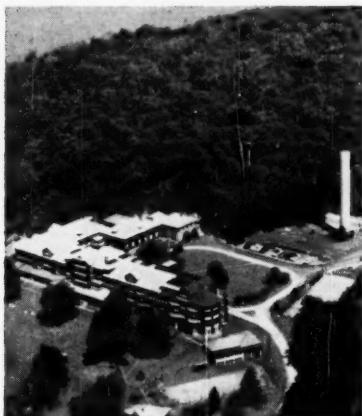
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## Reviews

### Sea Shells of Tropical West America

By A. Myra Keen. Stanford, California. 1958 Stanford University Press. 624 pages. Illustrated in color and black and white. \$12.50.

Between the Gulf of California and Colombia lies a coastal area rich in marine molluscan life. Until now there has been no attempt to list and illustrate this conchological richness. In this volume 1650 species of sea shells are described and about 1500 of them illustrated, several on ten pages of four-color plates. Among the 1500 species some seventy shells are figured for the first time. The notes provide geographical information that will guide the collector to the places where the shells most probably could be found. The author has used non-technical language wherever possible, but has also provided an excellent glossary of essential technical terms.

### Briefly Noted

*Let's Go to A Zoo.* By Laura Sootin. New York. 1959. G. P. Putnam's Sons. 48 pages. Illustrated by Robert Doremus. \$1.95. Story of a visit to the zoo and what goes on there. Written for the youngsters eight to ten.

*The Genetical Theory of Natural Selection.* By Ronald A. Fisher. New York. 1959. Dover Publications. 291 pages. Paper-back, \$1.85. Second and revised edition of this work.

*Ski the New Way.* By Franz Kramer. New York. 1958. Sterling Publishing Co. 127 pages. Illustrated. \$2.50. It seems that new methods are being introduced in skiing.

*How to Raise and Train A Puppy.* By Arthur Liebers. New York. 1958. Sterling Publishing Company. 64 pages. Illustrated. \$1.00. Instructions that apply both to the pedigree or mixed breed pup.

*Man the Whale Boats!* By Paul D. Augsburg. New York. 1959. Robert M. McBride Co. 135 pages. \$2.75. Story of whaling in the South Pacific in the nineteenth century.

*Whales and Whaling.* By Paul Budker. New York. 1959. The Macmillan Co. 182 pages. Illustrated. \$4.50. Scientific and historic information about whales and their capture.

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# Nature IN PRINT

By HOWARD ZAHNISER

## Pleas for Wilderness

"MAN CHANGES THE FACE OF THE earth much more rapidly than nature does," writes Joseph Wood Krutch in the first part of a short sentence on page 10 of his recent book, *Grand Canyon: Today and All Its Yesterdays*. He finishes the chapter, which is entitled "Where Solitude Is Easy to Find," with the observation that man "is creeping up on this area"—even this area, Grand Canyon! He concludes his entire volume with a plea for wilderness preservation, a cogent chapter that is entitled "What Men? What Needs?" and ends with the prophecy:

"The generation now living may very well be that which will make the irrevocable decision whether or not America will continue to be for centuries to come the one great nation which had the foresight to preserve an important part of its heritage. If we do not preserve it, then we shall have diminished by just that much the unique privilege of being an American."

It is an inspiration indeed to see this spirit of preservation evoked from the time-deep carvings of the Colorado River that Joseph Wood Krutch has known for twenty years, from top to bottom, from South Rim to Kaibab, all around, and from the air.

In another volume—unique, or with only one copy—Professor Krutch, with Eliot Porter, has submitted to the Chairman of the Senate Committee on Interior and Insular Affairs (the Honorable James E. Murray, senior Senator from Montana) a graphic and eloquent endorsement of the Wilderness Bill—a measure once again before Congress to establish a National Wilderness Preservation System and a national (congressional) policy and program for wilderness preservation and use.

### A modest program

To a bill that seeks to establish a modest program that will harm no other interests whatever, but nevertheless has been bitterly and falsely attacked by livestock and lumber

interests and by others with commercial designs on wilderness reservations, Professor Krutch and Eliot Porter have brought the support of Mr. Porter's photographs in color and Professor Krutch's accompanying paragraphs of comment and endorsement.

In his volume on the Grand Canyon, Professor Krutch makes no reference to any pending current legislation, of course, but in the spirit of its urgency he does point out that the decision whether wilderness areas "are worth having is one that must be made anew."

"It was made once a generation ago," he writes, "when the Park System was established with the explicit statement that the areas set aside were to be *permanently* reserved for specific purposes—not just preserved until some other use could be found for them. . . . If the original intention is now reaffirmed," he continues with a pertinence that we can apply to the Wilderness Bill, "the parks, the monuments and wilderness areas may remain to refresh, educate, and inspire for an indefinite number of generations to come."

*Grand Canyon: Today and All Its Yesterdays*, however, is not a book of propaganda, not itself an advocacy of any particular measure, organization, or program—none of which is even named. So much the deeper is the significance of the fact that even the Grand Canyon's condition and circumstances remind the thoughtful Mr. Krutch of man as an agent of change. The remembrance emphasizes for him the enduring values of the wilderness.

### Home for the spirit

"The wilderness and the idea of the wilderness," he writes of as "one of the permanent homes of the human spirit." To some men the discovery of America, he believes, the wild America of the Grand Canyon and the other great places of wilderness, had deepest meaning in its natural wild character—"what it *was* rather than. . . . what it might become."

"Here, as many realized, had been miraculously preserved until the time when civilization would appreciate it, the richness and variety of a natural world which had disappeared unnoticed and little by little from Europe. America was a dream of something long past which had suddenly become a reality. . . . The desire to experience that reality rather than to destroy it drew to our shores some of the best who have ever come to them."

". . . until the time when civilization can appreciate it."

Fortunately that time, when civilization can appreciate the wilderness, has now apparently come. In the culture of Joseph Wood Krutch—professor of literature, philosopher, maker of literature himself—a conscious appreciation of wilderness is a culminating aspect of attention to the Grand Canyon and of the resulting reflection on man and America.

### Value of poems

Another university professor, the late Lew Sarett, in the cultural richness of his life, expressed the same sort of appreciation when he tried to define the value of his poems. These poems the university student who became his wife and has survived him has collected anew in a volume called *Covenant with Earth*, which too many of us have so far missed.

In the introduction to his *Collected Poems*, published in 1941—which is used also as an introduction to the volume that Alma Johnson Sarett has more recently edited—Lew Sarett described his body of poems—the enduring essence of the highly civilized life that he led in wilderness, Indian reservation, cities, and universities—as an expression itself of wilderness appreciation.

"It is the outgrowth," he wrote, "of many years of life on the vanishing frontiers of the Rocky Mountains and of the forests of the Lake Superior region. It is an expression—however inadequate—of the feeling that much of whatever is joyous and significant in life, timeless, true, and peculiarly American, tends to be rooted in the wild earth of America."

His own gladness as a poet came in part, he said, in conveying to others "a slight measure of the wild beauty of America, of her mountain ways and forest life."

Like Joseph Wood Krutch, the poet Lew Sarett knew that "the roots of America strike deep into a rich earth, into the soil of a vast and varied wilderness." He believed

that "the character of the American draws its color and strength largely from the wild earth of America." He saw that "the remnants of them are a vital part of the life of our country today."

"Indeed," wrote Lew Sarett, "some of us think that these are all that matter much—the wild earth, nature: the enduring mountains that look down imperturbably on the human race, on its troubles, its momentary triumphs, its passing vanities; the permanent, fecund earth which yields up its fruit century on century and sustains the brute and human life of the world. . . . Some of us dedicate ourselves in our vocations and our recreations to. . . exploring woods and waters, or to discovering the rich resources of the wilderness. . . . And a few of us set out to devote our lives to re-creating for others the beauty of wild America; to writing much and to speaking much of American backwoods and frontiers, of wolves and deer and bear, of loggers and voyageurs and Indians."

Lew Sarett so wrote and so spoke. In my own college days he came as a speaker to Greenville College in Illinois and read to us his poems and told us his experiences. Carl Sandburg, in a "Foreword" to Mrs. Sarett's volume, praises Lew Sarett's "equipment," saying:

"Years a forest ranger and a woodsman, other years a wilderness guide, companion of red and white men as an outrider of civilization, university professor, headline performer on the American platform, he brought wisdom of things silent and things garrulous to his books."

When he read in 1928 on that Greenville College lecture platform his poem "Four Little Foxes" he voiced a compassion infectious and memorable, through the years, of the tragedy of a fur-trapping enterprise that could leave in the March snow "four little foxes" who had seen "their mother go."

His collected poems, not to mention the great Indian poems which deserve discussion all their own, take his readers homeward with him—

To all that blessed wildwood company  
With whom I band myself  
against the world  
And all its high concerns and  
tribulations.

No more fully can Lew Sarett's poems be reviewed in a discussion

that dwells on their inspiration in the wildness of America than can Joseph Wood Krutch's description and interpretation of the Grand Canyon he adequately appraised in an appreciation alone of his perceptions of the significance and value of wilderness and the concept of its preservation.

As lyric poetry, as sensitive portrayal and interpretation of Indians, Lew Sarett's volume is excellent. As description of the Grand Canyon and interpretation of the evidence it reveals of the geological changes of time and the ecological balancings of Nature, Professor Krutch's volume is personal, lucid, exciting, and satisfying.

Both volumes are rewarding in various ways, as well as superbly "successful" in their obvious purposes, but both are indeed moving testimonies to the high value that Americans place on the wilderness that once covered the continent, but endures only in remnants.

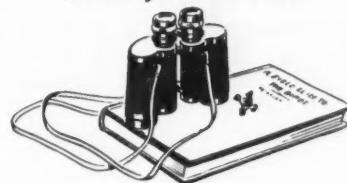
As the Congress, the law-making, policy-determining body of the nation, has before it the opportunity to reaffirm a purpose and establish a program to preserve such remnants, and as commercially motivated interests seek to frustrate this possibly last opportunity, it will encourage and inform those who support wilderness preservation to read such volumes and realize the broad cultural, national importance of the wilderness appreciation they share.

Civilization has at last come to appreciate the wilderness; the appreciation should become effective before it is too late.

*Convenient with Earth: A Selection from the Poetry of Lew Sarett, Including Six Poems Not Previously Published.* Selected and Arranged by Alma Johnson Sarett. University of Florida Press, Gainesville, Florida. 1956. xxvi + 177 pp. (5<sup>3</sup>/<sub>4</sub> by 8<sup>3</sup>/<sub>4</sub> in.) with frontispiece photograph of Lew Sarett, foreword by Carl Sandburg, introduction by Lew Sarett, an appendix of Lew Sarett's comments on his Indian Poems, and indexes of first lines and titles. \$4.75

*Grand Canyon: Today and All Its Yesterdays.* By Joseph Wood Krutch. William Sloane Associates, New York. 1958. 276pp. (5<sup>3</sup>/<sub>4</sub> by 8<sup>1</sup>/<sub>2</sub> in.) with 2-page frontispiece photographs in color, 2-page outline map, and geological cross-section drawing of Grand Canyon from Hopi Point to Tiyo Point. \$5.

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## Reviews

### The Audubon Book of True Nature Stories

Selected and edited by John K. Terres. New York. 1959. Thomas Y. Crowell Co. Illustrated by Walter W. Ferguson. 294 pages. \$5.00.

All of the stories in this anthology appeared in *Audubon Magazine*, official publication of the National Audubon Society, between the years 1942 to 1944 and 1948 to 1958. They are selections of true animal stories—not fiction—that have proved to be most popular with the magazine's readers, or which the editor himself—John Terres—especially favored. An editor enjoys a relationship to a story that is quite different from those of writer or reader. The editor has chosen the writing for publication in the first place, he usually has made contribution to its final content, and he has given the story permanence in type. Selection of the best thus reflects an intimate knowledge of the whole from which he is choosing a part.

John Terres' selections are all worthy of publication in book form. Some of them have by-lines of note in the world of Nature writing—Freeman Tilden, Alan Devoe, Edwin Way Teale, Alexander Sprunt, Jr., Lorus J. and Margery J. Milne, Peggy Mowery, William Byron Mowery. Others are by writer-naturalists less well known, but what they have written has great charm because the author has a story worth the telling to tell. This is the basic measure of the success of any story. Illustrations by Walter W. Ferguson attractively supplement the editor's choices. Here is a delightful book for one's own reading and rereading, and for giving to anyone who delights in Nature.

R.W.W.

### Orchids of Mexico

By N. Pelham Wright. Mexico 20, D. F. 1959. Editorial Fournier. Illustrated with 38 plates in color. \$10.00.

That Mexico is rich in orchids is amply proved by this book. The author supplies text in both Spanish and English. An introductory chapter gives a general and concise discussion of the orchids, revealing that there is still much to be learned about the classification of these plants in Mexico. With each color plate information on the distribution, vernacular names and other



William H. Carr

### OUR AUTHORS FOR APRIL

Veteran readers of *Nature Magazine* know that the by-line of John L. Blackford usually means birds. In this issue, the writer-naturalist and wildlife photographer of Libby, Montana, takes us into the live oak country of the California Coast Range to investigate its feathered inhabitants. . . Familiar to our readers is the name of Lois Crisler, who, with her husband Herb, spent eighteen months in the northernmost part



Lois Crisler

of the United States—the Brooks Range of Alaska—on a wilderness and wildlife photography mission for Walt Disney's "White Wilderness." The Crislers are residents of Lake George, Colorado. . . Jesse Stuart, school teacher and book, article, poem and short story writer of Greenup, Kentucky, lives with his wife on an 800-acre farm and private wildlife preserve in the W-Hollow that Mr. Stuart describes this month. "Four generations of my people have lived here," says Jesse Stuart, and our readers will feel that the author does not intend to break that chain. . . E. John Long, writer of articles on scientific subjects, is employed in an educational capacity at the marine laboratory of the University of Miami at Coral Gables, Florida. . . Robert J. Wyndham, a businessman of Upland, California, was born in Holland and came to this country in 1937. A free-lance fiction and article writer, Mr. Wyndham has appeared in a number of national publications, and also has contributed specialized articles to publications dealing with two of his hobbies, bee- and aquarium-keeping. . . William H. Carr is assistant to the president of the Charles Lathrop Pack Forestry Foundation of Washington, D.C. and Tucson, Arizona, and Director of Outdoor Education of the American Nature Association; he is also director emeritus of the Arizona-Sonora Desert Museum in Tucson, and writes with authority about the Museum's Watershed Exposition, since he originated and designed it. . . Warren D. Brush, retired employee of the U. S. Forest Service, is a Nature photographer who lives at Silver Spring, Maryland. . . James P. Jackson, of Washington, Missouri, is employed as an education advisor for the Missouri Conservation Commission. . . W. L. McAtee is a retired biologist of the U. S. Fish and Wildlife Service and a member of the Scientific Consulting Board of *Nature Magazine*. He is a resident of Chapel Hill, North Carolina. . . Richard L. Threet is an assistant professor of geology at the University of Utah in Salt Lake City. . . Elsie A. Parry, of New York City, is a member of the Society of Women Geographers, traveler, and article writer on topics that range from "the praying mantis as a house pet to a history of baby carriages," to use her own words.

data is provided, and as closely accurate scientific nomenclature as is now possible.

### Fishes of the Great Lakes Region

By Carl L. Hubbs and Karl F. Lagler. Bloomfield Hills, Michigan. 1959. Cranbrook Institute of Science. 214 pages. 44 color plates and many black and white illustrations. End maps showing distribution. \$5.00.

Two distinguished ichthyologists collaborate to bring up to date information on the Great Lakes fishes. In so doing, however, they point out that there is still more to be done with the classification of these fishes. In fact, the natural history of no single fish is completely known, and that of many is entirely unknown. There is still, therefore, a wide opportunity for the serious student, and this book opens the door to that opportunity.

### Briefly Noted

*The Graftor's Handbook*. By R. J. Garner. New York. 1959 (Second edition). Oxford University Press. 260 pages. Illustrated. \$5.75. Not a guide for dishonest office-holders or

the underworld, but a practical and valuable guide to making plants and parts of plants grow on other plants.

*Whooping Crane*. By Robert M. McClung. New York. 1959. William Morrow and Company. Illustrated by Lloyd Sandford. 64 pages. \$2.50. A story of these great birds, the remaining handful of which winter in Texas and breed in the far North.

*Tree Maintenance*. By P. P. Pirone. New York. 1959 (Third edition). Oxford University Press. 483 pages. \$10.00. Standard work on the care and upkeep of shade and ornamental trees.

### JERSEYITES! ATTENTION!

Word reaches us, just prior to going to press, that Senate Bill #12 in the New Jersey State Legislature would establish a program to "construct, maintain, repair and operate a recreation project at Island Beach, Ocean County, on the lands there owned by the State of New Jersey." Several years ago these lands were purchased by the State from private owners to prevent the subdivision and development of this last remnant of original New Jersey seashore; the last example of natural dunes and plant and animal life that are found in them. If this bill is passed the preservation of this unique strip of shoreline will be doomed!

# Contents

## noted BY THE EDITOR

**THE FIRST BILLBOARD INDUSTRY BILL** to be introduced in the 86th Congress is H.R. 3713, filed by Congressman James J. Delaney of New York. It is brief and demands that "outdoor advertising be regulated on a fair and reasonable basis, but not prohibited, and that the one-half percentum authorized shall be paid only to those States that regulate pursuant to, and in accordance with, such fair and reasonable standards as may be hereinafter promulgated by the Secretary, in order to comply with this statement of intent." In introducing this bill Mr. Delaney declared that the Federal Standards, issued by the Department of Commerce, under the Federal amendment to further restriction of outdoor advertising on the Interstate Highway System, are an invitation to the States to prohibit such advertising. He claims that the Standards misinterpret the law and he would deny the incentive payment to the States that apply them or exceed them. This will now be the industry's "ace" argument, and it will be evident in many guises. It also represents a reversal of the industry's championship of States' rights in opposing the Federal law. Certainly no State or community should be penalized for wishing to protect the safety and appearance of the highways under its jurisdiction. The bill has been referred to the House Committee on Public Works.

**A DRURY REDWOOD GROVE** in California's coast redwoods will, we trust, soon be a most appropriate reality. Charles M. Goethe, conservationist, naturalist and philanthropist of Sacramento, has announced the gift of a third redwood grove to the people of California. He has already established two groves, one, the Mary Glide Goethe Memorial Grove, dedicated to his late wife; the other the Jedediah Smith Grove, in memory of that Bible-toting pioneer. Now he has made a gift, to be matched by State funds, that would pay tribute to the brothers Newton B. and Aubrey Drury, pioneers in the Save-the-Redwoods League. Newton Drury served as executive secretary of the league, which post he left to become Director of the National Park Service, and he has just retired as California's Director of Beaches and Parks. His brother, Aubrey, took his place as executive secretary of the League. It seems manifest that no tribute could be more appropriate, and we feel that it is especially fine since it will pay both men due honor while they are still with us to enjoy such honor.

**MISREPRESENTATION OF FACTS** are, of course, often used to oppose that which one does not favor. Sometimes this is deliberate; sometimes wishful misinterpretation. It is, however, surprising that there should be so much of this sort of thing in the ranks of those who oppose the Wilderness Bill. Many of the statements that are glibly made against the bill, and often printed, are deliberate lies. Claims are made that the bill would do certain things and says certain things that are not in it at all. Lumbering, grazing and reclamation interests are the most vociferous and the most prone to misrepresent the proposed legislation. A resolution recently adopted by the annual meeting of the National Reclamation Association declares that "certain outspoken groups have recently advocated and urged the conversion of vast areas of the public domain" into Wilderness Areas. We did not know that it is a crime to be outspoken, but "vast areas" is a deliberate misrepresentation, as are other points in the resolution, if it is read in relation to the bill as it now stands.

**SENATOR HUBERT H. HUMPHREY**, together with nineteen of his fellow Senators, has introduced S.812, a bill: "To authorize the establishment of a Youth Conservation Corps to provide healthful outdoor training and employment for young men and to advance the conservation, development, and management of natural resources of timber, soil and range, and of recreational areas." This is a measure that, in our view, has definite social implications of much value. More than that, we feel, it would provide a valuable and much-needed source of man-power in conservation. The Emergency Conservation Work—which became known as the Civilian Conservation Corps—of early depression days was hurriedly conceived and brought into being. Some of the work found for the hitherto unemployed young men was of questionable, sometimes negative value. But the Corps, by and large, served its human purpose and made substantial positive contribution to conservation progress. Its weaknesses should serve as a guide to a conservation force such as Senator Humphrey proposes. Furthermore, the conservation agencies today are in a much better position efficiently to use such a force than they were a generation ago. We hope that S.812 will receive widespread discussion and be amply heard by the Senate Committee on Labor and Public Welfare, to which it has been referred. R.W.W.



Once the wide savannas and oak-grove grasslands of the rolling California ranges were the unchallenged kingdom of the royal hunter of the hills, the golden eagle.

L UPINE flooded sky-blue across the rolling hills. Blue larkspur nodded amid tall green grasses carpeting parks and aisles of the scattered groves. Up over high knolls, where often the shiny-leaved oaks gave way to the grasses, wind-rippled fields of poppies painted the spring with bright gold. And the fluffy, cotton-white clouds idling above the hills hung just where an artist would have brushed them carelessly on his canvas.

*Skwape, skwape!* burst from a proprietor jay, discovering a stranger lolling under a spreading patriarch in his cove, while above me, as I fitted my back in rugged comfort to the huge tree's furrowed bole, a plain titmouse, equipped with a green worm, entered a knot-hole on the under-side of a great crooked bough. Had I suddenly awakened from a Rip Van Winkle dream, I would not have doubted where I was—in the mighty live oak groves of California's friendly Coast Range.

As if he feared that I might share Rip's fate, an acorn woodpecker shouted, *wake-up, wake-up!* Giddily he flashed paint-pot colors before me in the lazy sunshine, looping down from the big tree's ancient crown. Yet, he only confirmed the dream. For such is any spring-

## Wings and Song in Mighty Oaks

By JOHN LINDSEY BLACKFORD

*Photographs by George M. Bradt  
and the Author*

time afternoon in the emerald hills beneath the live oaks with the birds.

Rimming the Great Valley, rolling over the coast ranges to the sea, greening with their groves the foot-hills, crossing coastal mesas of the south, the mighty live oaks of California capture the lower woodland

levels of the State. Only valley oak shares with them the heart of the Californian oak-lands—those affluent regions largely beyond influence of the far-flung conifers.

Now beneath the massive oak tree, too close for comfort, a midget nectar hunter of the foot-hill canyons zips to the beckoning flowers. I know the blurred flash for the rocketing color-stream of a darting black-chinned hummer. As the glinting streak pauses among blooming larkspur, a jewel-like gleam shoots from the violet-throated missile of bronzy-green.

From prickly leaved branchlets of the arching oak come languidly the dutifully repeated notes of a tiny foliage gleaner. The glasses seem to trace them to an olive-clad little songster listlessly exploring the canopy of spreading boughs above. Hutton's vireo is spring fever in feathers. "He never hurries," relates Dawson: "Why should he? It is California, . . . but it has always been California. The sun shines. Tomorrow will be like today. . . . Chu weem chu weem. . . . What's one bug more or less? . . . Chu weem."

With that musical sleeping potion so potently administered, one must dream. The breeze is from the sun-soaked hills. The warm fragrance from the flowers. The blurred whirr of the scintillant hummer ebbs to a soothing drone. And the green carpet of spring is irresistibly inviting under the oaks. . . .

It is that jay again! Or maybe it is another jay; for I have come down from the plush-green hills still in a

dream. From moss-hung live oak shade, Puck-o'-the-Woods glides to the grassy floor of a sun-patterned avenue through monarch trees. His broad blue wings mark a dashing curve of color in the patriarchal grove.

From beyond, where oak and thicket give way to chaparral, comes the animated argument of tiny bush-tits—an excited discussion as to whether unfeathered photographer or jaunty jay is the greater danger to their hanging nest-hammock, filled with a fabulous family of seven or eight. It is safe from one, at least. Too many lodged leaf-clusters and draped mosses resemble the pendant pouch to encourage another search today.

Deeper in these ancient oaks should wait some better fortune—perhaps a screech owl, that reliable cavity dweller of old woodpecker holes and time-aged tree hollows. Or a majestic horned owl may award the shaded acorn halls his savage presence.

In such dark and arching aisles California live oak is king of its leafy kind. At its best the monarch is massively short-trunked, with broadly dome-shaped crown. Blackish, broad-ridged bark girds its red-brown heart-wood, and a sapwood that is thick and darker still. Southward *Quercus agrifolia*'s deep green and varnished foliage meets and mingles with the smooth blue-green of mesa oak.

From the slopes of Mt. Shasta marches interior live oak, deploying leathery leaved columns through low

Dotting the foothills of the Coast Range are vagrant groves of California live oak, with a spring background of fluffy, cotton-white clouds idling above the higher summits.





The plain titmouse, first cousin of the chickadee and lively resident of the evergreen oaks of the foothills, often accompanies the California jays on their foraging rounds.

A midget nectar hunter of the live oak hills and canyons is the black-chinned hummingbird, below, a jewel-like bird with a shimmering, violet-banded black throat.

valleys and over the foothills of the High Sierra; and westward into the coast ranges, yet away from the sea. A stout acorn-bearer, it fails of the enormous proportions of California live oak, but seen by itself is a vigorous tree.

These three stalwarts, California, mesa and interior oak, with their frequent friends, are the architects of the live-oak woodlands. With valley oak they create the valley parklands, and yielding higher, hotter, rockier slopes to blue oak and digger pine, with them largely make the green mantle of the California foothills.

Where encinal woodlands meet leafy river borders, or shrubbery gathers densely under stream-bank and hill-side live oaks, the rolling mellow melodies of the black-headed grosbeak enrapture countless sunny California hours. Often the varied and accomplished ecstasy of this western artist pours from the glinting canopy of one of the great evergreen broadleafs. "The wonder of life amazes him," recounts an observer. And he shares his overflowing joy with the woodland world.

In broken coastal woodland where oaks climb toward darkly-needled evergreens, or in canyon and stream-side live oaks inland, purple finches express their love of moist and shaded places when nesting beyond confines of the conifers. Although then they seek humid haunts of seclusion, their liquid rhapsodies are earlier heard, writes Ralph Hoffmann, "from the blossoming willows or the sycamores just coming into leaf where the canyon stream comes into the plain." Wild, gushing, unrestrainedly free, their cascading medleys claim all the vigor and inspiration of that mountain melody, the kindred song of Cassin's vireo.

The brightly flowered carpet of another spring unrolled in valley parklands about Clear Lake, and on to its low, evergreen-oak-dotted hills. From autumn weeds



hidden by vernal blossoms was wafted other gladsome bird song—the carefree chorus of flocking Lawrence goldfinches. Their blithe sweetness always recalled Dawson's inspired impressions: "a little hurricane of song, breathless gladness of childhood welling from a hundred childish throats." Their winning confidence, that readily accepted a wanderer idling in their midst,

renewed our own faith that Nature yet holds trust in us.

Gray-green of breeze-tossed digger pines blending with blue-green of blue oaks below Hazel Creek frame my first memories of Nuttall's woodpecker. The boisterous little woodsman seemed inevitably to lead me into sun-caressed blue oak aisles. But Dawson, with experience as certain as impression, tells where to look for this bird among the live oaks. And in telling, he reveals the very vale where we would endlessly linger: "A narrow canyon whose floor harbors sycamores and alders and bay trees, nourished by a purling stream. . . whose sides are lined with live oaks which run up into. . . chaparral, is precisely the best spot to look for *D. nuttalli*."

Often one is intrigued by possibilities that wait in the clash of two assertive personalities. What happens when the columned yellow pines bring their boldly blue and spirited crested jay down to the borders of the mighty live oaks? How does the dull blue but dominant California jay, regional form of the scrub jay, receive his jaunty highland kin?

Their differences were of my imagining. At Hurkey Creek on San Jacinto, under the last descending pines, a blue guardsman of the conifers hacked amiably upon an armored cone, while around him a family band from the oak lands garnered wing-strewn pine seed.

And at Glencliff Oaks in the Lagunas, roving gray-blue squadrons of the Californias sported the darkly-brilliant gendarme blue of crested comrades in their aerial ranks on forays among the encinal broad-leaves.

Small, Quaker-gray plain titmice accompanied the jays so regularly on their foraging rounds that I had passing chances at all of them from photographic ambush. Evidently the titmice had never heard of the "bad boy" reputations of their blue-flighted friends. Or the little knot-hole nesters had no reason to fear them at any season. One lucky morning all three species of the troop recorded themselves in swift succession on my film, the only occasion on which the quick little "camp followers" of the jays were captured successfully by the shutter.

The California jay is the ubiquitous character about whom much clamor has sometimes arisen. Whether he prefers quail in the shell, rather than on toast, as does the "sportsman," or collects almonds before the orchardist who has preempted valley fruitlands, or likes birdlings in the nest to the chagrin of bird enthusiasts, the matter is—in a manner—beside the point. It appears that we delight in his "rascality," or curse him un-

mentionably as "thief" and "villain," depending on whatever our own self-interest happens to be.

In reality there is nothing "criminal" about the California jay. He is just what he was meant to be: Nature's skillfully evolved and needed biological control factor in the brushlands where other predators have failed. More than in the oak groves, the California is most at home where oak and chaparral meet. On hill slope, in canyon and ravine, where that dwarfish cover mingles with broken and scattered woodlands—that is this jay's fief. Not truly brush, for it is above low shrub level; nor miniature wood, for it is thicket-and-tangle; but "elfin forest"—such is the chaparral.

Scrub oaks, chamise, buck-brush, manzanita, chaparral pea, toyon and poison oak, these and many others create the branch-work maze of dry-belt chaparral. Where coastal fogs exert moist influence, and the elfin forest attains to ranker stands, madroño, laurel and woodland oaks join in. There, especially, where nest-



The California jay is Nature's skillfully-evolved and needed biological control factor in the dense oak-chaparral brushlands where other predators fail. Here spring-like legs are more important than talented wings.

trees border and mingle, where small clearings and bare ground patches open the thickets to foraging and adventure, the California jay is the brushland's presiding soul.

Few hawks and owls invade thick chaparral, so in this precocious jay Nature has perfected a part-time hunter assigned to play the predator in the scarcely penetrable thickets of that wide-ranging cover. It is short-flight cover. Spring-like legs are of more avail than skillful wings in searching intricate tangles. In the over-all interest of the Wild—which is ever the

welfare of species more than of individuals—predation of nest and nestlings has proved effective in population control. It serves as efficiently in keeping Nature's balance as wing-hunting of adult prey, commonly the major check upon excessive numbers outside the chaparral.

In the end, whatever the misdemeanors of this blue-gray rascal, we find in him extra measure of wit, drollery and impudent glee. *Skweep! Skwape!* Another hand-out for the "sweet, authentic devil!"

Once the wide savannas and oak grove grasslands of the rolling California ranges were the unchallenged kingdom of the royal hunter of the hills, the golden eagle. There, scattering oaks and gray pines waited for his eyries, beckoning more subtly in a land of bounty than the traditional cliffs themselves. Now holding in adversity to rugged coastwise strongholds, this regal corsair sweeps the open oaklands of a more limited terrain, a winged blight upon the "jacks" and ground squirrels that are his favored quarry.

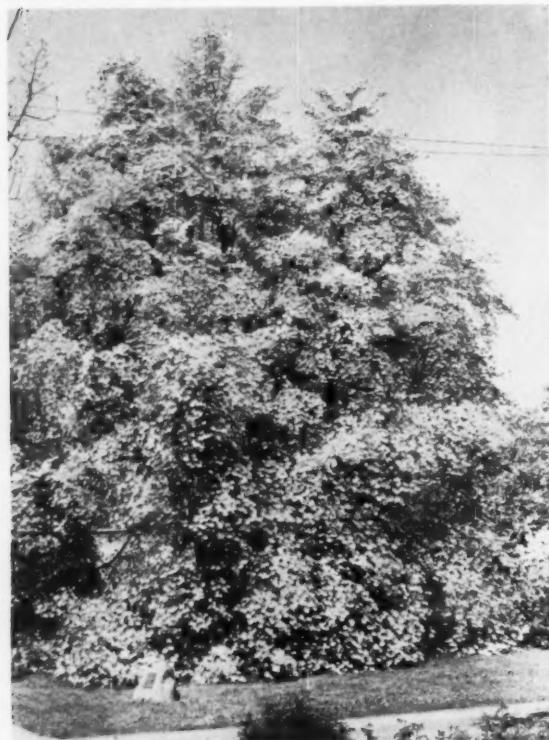
The mountain eagle's shadow is passing terror to most wildfolk. But in rabbit country his talons do not fall

heavily upon other kind. And in the fascinating, inter-related story of their various lives, a newer, comprehending science reveals that, like other predators, the golden hunter is vital to the lasting welfare of his prey.

If by fortunate chance we behold him mount above the canyons, leaning on the rushing up-drafts as he wheels into the blue, we know that we have caught the master moment, claimed the ultimate thrill that only wild, unfettered wings bestow.

In contrast with that boldest panorama of the skies, we gaze some wind-fresh morning across rippling marshlands. A white-tailed kite hovers so light and fragile that like thistle-down it will be blown beyond the oak-fringed margin. Yet, like a slanting silver sail, the kite makes headway against even wilder gusts.

Still the ribbon of the road winds on under the mighty oaks, and we must follow after. Remember their spreading coolness? Their ancient, moss-draped canyon shade? Their sun-filled, flowered parks and aisles? Were it only in a dream, we shall go back to the blue-skied, live oak hills of California's beckoning Coast Range.



A Pacific dogwood on one of the streets of Milwaukie, Oregon, is thought to be the largest dogwood tree in the United States. It is sixty-five feet in height and has a trunk circumference that measures a full seven feet.

## Our Largest Dogwood

By JOSEPH W. WILEY

*Photograph by the Author*

**O**N A QUIET residential street in Milwaukie, Oregon, spring arrives amid a massive display of white blossoms. For here stands a tree said to be the largest dogwood in the United States, a native Pacific dogwood more than one hundred years old that is covered with bright white bracts to the very top of its sixty-five feet.

Pacific dogwoods are the largest in the family, and twenty to thirty feet is considered an average height. The name "dogwood" is thought to have been applied to this tree originally because the wood was once used for making skewers or "dags," and in time the word "dagwood" became dogwood.

This largest of all dogwoods has a circumference of seven feet, and in the springtime, with its heavily white-blossomed branches touching the ground, small children find a storybook setting for their secluded play. Since 1952, the Susannah Lee Barlow Chapter of the D.A.R. has cared for the tree, and has erected the two-foot-high marker to be seen in the foreground of photograph. 



One morning the author, against her better judgment, opened the wolverine's cage door and allowed him to come out into the pen. The fierce mammal, often known as "the bandit of the north," circled her warily, then accepted a morsel of food.

*Said the trapper of the wolverine—*

## "He Not Scare a Damn"

By LOIS CRISLER

THE LAST animal I expected to see, when my husband Cris and I went to Alaska to film wild animals, was the mysterious "bandit" wolverine. But at our first thrilling camp in hip-deep snow on the Yukon, there was a wolverine sign—old scratches in a steep clay bank where he had climbed to claw out birds' nests.

I panicked at our next camp on finding fresh tracks, like those of a small bear. "Nothing can save our supplies now," I said. But the "shadowy demon of the north," "more dread than grizzly with cubs," never re-passed.

I longed to see him. On July 4, I missed by ten minutes a remarkable sight in Mt. McKinley National Park. Our neighbor saw it—three queer, slim, month-old wolverines romping on the most delicious of wilderness playgrounds, a bank of warm, crushy, spring snow. I saw only their sparkling tracks.

"What were they like?" I begged.

"Like monkeys," she said promptly.

"How did they play?"

"Like—like monkeys!"

Again I was frustrated when it was Cris, not I, who saw and actually filmed a wolverine. Then I saw my first one and dared not even tell Cris; I thought it was an optical illusion.

From our tent door by a frozen lake north of the Brooks Range in arctic Alaska, I saw this small, black-looking animal running over the snow. I went for field-glasses. When I returned it was gone. There was no place for it to have gone to! You could see for miles.

What had happened was this. In April, on their spring migration, winter-weakened caribou die; around our lake lay four, in thawed snow hollows that hid the wolverine. Every day or two he made the rounds, pausing a few minutes at each carcass, galloping to the next, always in the same order. Only bones and tufts of hair were left. But who knows, there might be one more shred of meat. A little animal making his living



"I took one snapshot of his distrustful striped face at the opening to show Cris what had become of his wife in case wolverines are all they are cracked up to be."

in the Arctic dares overlook no bet, miss no possibility.

As we stood by our snowy tent one May morning, watching two dozen caribou file along the shore, they suddenly ran, then stopped to look back. We looked, too. Following their handy tracks, at a dead gallop, here came "our" wolverine.

"Why, the crazy little thing!" said I. "He can't kill a caribou." That feat can be performed, not in shallow arctic snow, but only where deep snow handicaps the caribou.

We laughed. The businesslike wolverine, looking neither to right nor left, walloped steadily along the file of slender legs. All heads bent down, around, up, gazing as he left their owners flat-footed and galloped single-mindedly toward the next carcass on his beat.

He confirmed one word of an old Eskimo dance-song, *The Busy Little Wolverine*: "I like the wolverine; he's so brave and strong and busy." Anyway, busy.

Then Cris confirmed "brave." Unarmed, as usual, he started across a tundra marsh. Then he saw a wolverine going lippetty-loppetty—that everlasting lopsided wolverine gallop—along the far side. It stopped to dig. "I walked on," says Cris, "thinking he'd run. When I was a hundred yards away he looked up. He stood up like a little bear to watch me. And did he run? He started toward me!"

"I was a little worried. You could tell he could put up a mean fight. Then he went back to his work. He had found a little colony of voles. I walked to within fifty feet, watched him catch and eat three, and he paid no more attention to me. That French-Canadian trapper was right: 'He not scare a damn!'"

Twin secrets were revealed by that wolverine—the secrets of his "species temperament." First, sheer

fanatic determination. It has branded him as brave, as mean, as uncannily smart. Best of all bandit-wolverine stories, because it shows this wolverine temperament, is that of famed Arctic explorer, Vilhjalmur Stefansson.

He and his traveling companions killed a caribou and wanted to cache part of it for their return later. But how protect it from the wolverine? This was an intelligence test of the arctic wilderness. The prize could be survival. The men dug a pit for the meat, covered it with stones and slushy snow to freeze iron-hard. They left.

Along came the wolverine to take the "test." Who won? The men returned to a robbed cache. Somewhere in the flat white Arctic roamed a well-fed wolverine. How had he done it? In one way only, says Stefansson. He must have curled up over each stone in turn till he thawed the ice and could move the stone. It may have taken days. Determination had served him just as well as tools or brains.

The second "secret" of wolverines puts us on the brink of the unfathomable gulf between species—we look into an utterly non-human universe. The wolverine is a weasel, biggest of land weasels, that include skunks, badgers, martens. His weight, only thirty-five pounds, gives him the odd distinction of the average size in the whole range of animal sizes, from least weasel to whale. Only his playful, lovable sea-otter cousins outweigh him. He most resembles his littlest cousins, cool fierce little weasels themselves. His secret? Coolness.

The wolverine's aggressive determination we can understand. All of us at times have felt that nothing could stop us. The difference is that we key up to it. He keys down. He has a built-in tranquilizer. A wolf's nerves quiver. His are calm. Worried wolves will not

"...delicately he abstracted the morsel. When Cris came home, he found "Scappie" daily eating tidbits from my hand. I never starved him to it..."



eat. Wolverines do not worry; they eat. They even break off a growl to yawn. A troubled wolf has insomnia. A wolverine falls asleep before your eyes. Grizzlies and wolves consider what you might do. Cool, self-centered, the wolverine considers what he wants.

Our next wolverine showed us a deeper mystery than species temperament—something about all things in wild Nature. Most people do not realize it is a scarce "emerald" of wilderness experience to witness wild animals of two big species meet. It was a flawless, square-cut "emerald" for us the June day we witnessed wolf and wolverine on a collision course.

We saw the wolf first. She stood on the point of a low ridge, against silvery clouds. Her tail hung straight down. We thought her den was on the ridge. We had noted converging wolf trails in the snow. Suddenly she turned back along the ridge and we saw the wolverine angling up it. Fangs and fury? It was subtler than that. A meeting at the summit between two kinds of dictator-predators.

The wolverine was hell-bent on following the ridge, perhaps scenting meat cached for the wolf pups. The wolf was not about to let him go. So long-legged that her fast footwork looked casual, she headed the squat wolverine, pointed him downhill. Like a compass needle he swung back to course. The last time he kept going downhill. She returned to her lookout. Neither "dictator" had wanted a fight.

There is more getting-along-together in Nature than our fierce species thinks. On the great tundra all mammals, predators and prey alike, must step and sleep on the same big mattress of lichens and herbs, far-spreading under the pale-blue arctic sky. They can not jump off

the planet. They must accept their home as it is.

Everywhere we went in the Arctic we found tracks of one wolverine only. He is a solitary, circumpolar animal of Asia, Europe and North America. Like those other true-wilderness creatures, condors and grizzlies, he needs great untroubled space to make his living. Hunted almost to extinction in the United States proper, never going far south except along mountain ranges, he now is starting a comeback in Idaho.

Untested yet was one dance-song word, "strong." An Eskimo girl averred her uncles had watched a wolverine dig under a leg of moose and drag it off over his shoulder. Incredible? Then we dollied in to such a wolverine closeup as we had not dreamed of. To our lonely arctic camp were flown two captive adult wolverines.

Curiously I peered through bars into the dark box of "Sickie," one of whose great tool forepaws was trap-hurt. Her hissing lunge to the bars scared me. She seethed. Her purring growl rose to a shrill rattling growl, punctuated by "barks"—breathy affairs. She sat up easily, bearlike, and lifted one tool-paw.

Cris liked the dauntless wolverines. He said, "They're in a miserable situation—iron bars, hurt paw, big superior animals coming up to them. But they don't lose their spirit. You'd go off in a corner and whimper and wail. Wolverine says, 'What the hell! Wough!' If we had half their spirit we'd be better off."

Sickie and Scappie showed us what all good wolverines learn or know as babies: never foul the den. Their heavy metal water-pans were wedged so tightly under the bars it was all we could do to wrench them out. Each wolverine backed up neatly, excreted in its "flush toilet," then rammed it from the cage and out of the way.

Cris built them a big pen, trenching deep to set the wire, filling the trench with rocks weighing up to 200 pounds. Yet, every morning, some of those rocks lay on top of the ground. How did Scrappie do it? (Sickie had escaped.) Cris watched, then told me how.

"He digs a little hole under the rock so he can get his shoulder under it and start pushing up. He contracts his muscles as if he were hiccuping. The rock begins to shake. Dirt vibrates with his 'hiccups' till it sifts under the rock. Finally he hiccups that rock right out of the ground!"

Cris hid an open can of milk back of a quarter-inch plywood board, to see how a wolverine breaks into a house. "In no time he ripped a hole so he could get through. There was still the two-by-four the board was nailed to and the can was under it. Scrappie started tearing the two-by-four. He would put head and shoulders through his hole in the plywood, get a mouthful of two-by-four and emerge with the splinters sticking out like bristly whiskers. Every time, he turned and gave me a long look, quiet and defiant, giving me his whole attention. Then he'd spit those splinters out and hurry back for more."

The first evening after Cris left to camera-hunt in the trackless Brooks Range for a week or two, I sat down lonesomely before Scrappie's cage. I was ninety miles from the nearest Eskimo, hundreds of miles from doctor or nurse. I was tempted. His small, matter-of-fact eyes and round innocent forehead reminded me of one of my childhood playmates.

He gave me a sullen, withdrawing glance with beady eyes unlike the clear orbs of fox or wolf. Fiercely he grabbed a hank of hay and covered the one bone he had in his cage, grabbed another mouthful and sat up.

I summoned my honest admiration for him and spoke. My eyes must have changed. Suspicion relaxed from his. He yawned, showing a pink mouth and teeth functionally assorted as to size and fell to doing his chores. First he licked his wide tool-paw underneath and between the toes, cleaning it with wolverine neatness after his meal. Next he lifted it so cat-like that I thought he would actually wash his face. He did. He wrinkled nose and face, gripped them between his paws, hiding his eyes, and dragged the paws down over his

cheeks. One white claw caught lightly on his lower eyelid. Really I had the impression he was showing off in response to my fussing over him. Next he groomed his fur, pulling out clumps of shedding underfur.

Then, to my wondering surprise, he sat up again, bent his head as if to inspect his navel, tipped over and laid one broad paw like a bandage over his small dark eyes, calmly excluding my presence and the quiet gray light of the arctic summer night. He slept.

The next morning I fed him, brought water, cut dry grass and made a fresh sweet bed in his cage. Then, while reason chattered warnings, I climbed the camera-scaffolding outside the pen, lowered our willow ladder and climbed down into the pen. I pushed up the door of the cage. I took one snapshot of his distrustful striped face at the opening to show Cris what had become of his wife in case wolverines are all they are cracked up to be. Then I sat down and awaited fate.

He came out. He circled me warily. I turned as he circled, holding out a morsel of meat. A cream-colored sash went around his low-slung, orange-brown body, deepening to a bertha around his rump, narrowing to gray arches over his eyes. He had a peculiar lift and bounce even when walking and deliberately, gracefully laying down each huge forepaw—it looked as if a third of his sturdy leg bent out in paw. Cause of the bounce was the high arch of his rump, slanting down toward the tip of his nose. The hustling wolverine lope must come easily as a result of straightening that rump-hump.

He fastened his inscrutable black eyes on mine. Would he give me "the bum's rush?" Scared and delighted, I sat motionless, holding out my hand. His harsh little furry muzzle brushed my fingers. Delicately he abstracted the morsel. When Cris came home, he found Scrappie daily eating tidbits from my hand. I never starved him to it, but fed him first.

One morning, watching three wolves play on the tundra near the pen, I suddenly noted a fourth animal—Scrappie. He must have just escaped. He glanced carelessly at the wolves; they glanced at him. He nosed each tussock, taking up already the serious business of making a living. He lifted forepaws to a rock and gazed around with weasel-reared head. He saw me. He galloped away into the great freedom of the tundra. ♦ ♦

## BIRD WATCHER

*I cannot hear the song this bird is singing,  
It has flown much too high and much too far,  
And yet I know it sings.  
I cannot see the wings this bird is spreading,  
For it is closer to the sun than earth,  
But it has lovely wings.*

*Sometimes the knowing is enough, the trust,  
The soul denied a loaf, accepts a crust.*

Bessie F. Collins



"Always, from early to middle and late April, bluets grow on every bluff; blue violets, white violets, and wild pansies lift their heads above the old last year's leaves."

## April Poem on the Wind

**W**-HOLLOW in April is the prettiest valley in the world. It is not more than five miles long. Its waters flow into tributaries from all over the small basin and are joined together in the main stream, W-Branch. The water in W-Branch and its tributaries fairly sings over the slate-stone and gravel on its way to the sea. The little creek bottoms in this narrow-gage valley are always green at this time of year. And, even earlier, when there is not a green leaf anywhere else, the wild water-cress grows in these bottoms, and the green-pickers seem to appear from everywhere. In light winters I have seen these creek bottoms remain green.

Then, in early April, the trailing arbutus comes to the bluffs and the weeping willows' long green fronds claw at the bright winds. The service trees bloom along the bluffs above the low rock cliffs. They shed their blossoms on the April-blue water in the stream below the cliffs. The petals float away on the swift water like little ships with white sails. Somewhere along the little bluffs, the babys-tears grow. The hazelnut bushes bloom with long, ugly clusters of blossoms that look like brown worms hanging on barren stems. The greenbriers are bright-green waves of water when the wind blows up the hill under the oaks. This is in W-Hollow, our little valley. But who looks at a greenbrier? And how many hunt for the hazelnut blos-

soms and trailing arbutus? There are many who prefer other ways of relaxation than to hunt for the beauty of a valley in the springtime.

Always, from early to middle and late April, bluets grow on every bluff; blue violets, white violets, and wild pansies lift their heads above the old last year's leaves. They bloom everywhere. On land too thin for scrawny pine to grow, there are golden carpets of cinquefoil in April. Believe me, the scrawny pine blossoms are beautiful. Only yesterday I brought a spray of pine blossoms home. Naomi put it on our table.

On a few bluffs are the small white blossoms of wild strawberries. They whiten a few spots of earth, and later on these will be red with berries. The wild alum grows in the rich coves on the bluffs and sweet william prefers to grow in the leaf-rot loam.

At the foot of several bluffs in W-Hollow where the soil is exceedingly good the earth is covered with this beautiful wild flower in April. The bluff is a blue mass of sweet william. And one of the prettiest of flowers is the whippoorwill flower, which grows on steep, thin land beside the cliffs. It has a long, fragile stem and a row of narrow red petals. The reason it is named for the whippoorwill is that it blooms about the time we first hear these birds in the spring. Now we are hearing many whippoorwills in this April

By JESSE STUART

Illustrations by  
Charles L. Ripper

valley, and the exquisite flower is blooming everywhere.

It is nice, in the evening, to take a brief walk up the valley when the moon is shining. It is good to look across the creek by the tool-shed and see the whippoorwill flower wet with dew and red in the moonlight on the steep bluff above the water! For a long time this bluff held the whippoorwill flower when it did not grow and blossom in many other places in the valley. Now



"... in early April,  
the trailing arbutus  
comes to the bluffs..."

it is growing in other places, and the bluffs down below our house are red with these blooms.

Wild plum has flowered throughout this valley. It has shed its soft sprays of blossoms before the dogwoods have bloomed in full. Right now the wild plum and the dogwood are white sails on the green hills of the valley. Their blossoms are bleached white, starched and ironed stiff. One could not believe that there are so many dogwoods here until he passes through and sees the blossoms. The white sails are mixed with the red sails of the redbud—a beautiful sight at sunset. This valley holds one at this time of year. One who has lived in this valley all his life, as I have, hates to leave here, even for a visit, in April. This is the *right* time of year in W-Hollow. It is the most beautiful time of year.

Scarcely an April for the past twenty years have I remained all the month of April in W-Hollow. I went to other places of America because I did extensive traveling and speaking. I may have been, at one time or another, in forty-four American States in April. I have traveled over much of this country in April springtime. I was fond of April spring where the desert flowers were blooming. But I have always known, deep within me, that the most beautiful April springtime in the world was where I lived in W-Hollow, a small valley in the hills of eastern Kentucky. I wanted to return to this place when I was away in April. I have seen many countries and their beautiful valleys in this month. The English country side is really nice at this time. And I look back longingly when I think of it, and the many places I would like to see again over there. But I do not know of any country nicer than my own valley at this time of year.

Now the April sky is as far away and blue as if it were

a high blue bowl turned over us. It has been washed clean and was dried before it was put there. And the wind beneath this distant blue is as clean and crisp as if it were clothing, washed, starched, and hung out on the lines in the sunlight to dry. But wind is not hung upon a line to dry. Wind is not starched and ironed. Wind can be washed—and this wind has been—and there are but few things here to make the wind dirty. There is no smoke, sandstorms, nothing near us to pollute our air. The wild birds fly through it and sing and the crows cut geometric figures through it with their flapping wings as they dive under the green clouds of leaves to hidden nests.

W-Hollow is a land without a cemetery. It is a valley with one winding narrow road leading across it. It has a few houses, mostly old ones, but a few that are modern. It is a valley of little creek bottoms used for farming, and a basin of little streams. With high ridges' rims surrounding this basin, except where the stream flows out, it is to the golden eye of the April sun a round, green, deep dish, with high walls; but there is a chip broken out. There is one hole in the wall that keeps it from filling with clean, blue April water.

The soil is like dark meal when it is dry in April. The plows turn it over and the horses and tractors pull disk-harrows to cut it to pieces. It is good soil, for the most part, in these creek bottoms. It is good soil where trees have had long years to refertilize with their leaves, their old bodies and their broken twigs torn off by the winds. It is this leaf-rot loam that brings the sweet william and the lush growth of vegetation that in turn dies in autumn and go back to earth for refertilization. So earth under the trees here has a thin layer of good top-soil.

For W-Hollow's great beauty is in its canopy of green trees of hard and soft woods. The poplars grow

"One could not believe that there are so many dogwoods here..."



tall in W-Hollow, and throughout the valleys of the little tributaries. The yellow pines grow tall enough on hill slopes to make mast poles on the old sailing ships. And it is wonderful to see the needles on the fingers of yellow pines scratching at the high winds that blow and rustle the green clouds that enfold W-Hollow basin. It is a tender April green. It is a new, soft, tender, almost silken, green. It (Continued on page 220)

When twilight fades the parrotfish seeks a sandy bottom and from its beak exudes long gossamer threads, which it weaves into a cobweb-like envelope that soon encases the entire fish.



AMERICAN MUSEUM OF NATURAL HISTORY

*A strange sea-dweller is the*

## Nightgown-Weaving Fish

By E. JOHN LONG

WHEN scientists first saw it, they thought they were watching a very sick fish. But its breathing and other reactions appeared to be normal. And furthermore, it wrapped itself in a mucous envelope only at night, swimming out of it again in the daytime to lead a normal piscatorial life. What the surprised scientists were observing finally became apparent—it was a fish that actually wove its own nightgown when darkness fell, and shed it at daybreak!

While most fish do not sleep, it is well known that many species rest on the bottom or among reef and rock formations at night. Some of them lean against various objects, such as boulders, coral or shells, as they while away the hours of darkness, neither feeding nor, what is much more important, being eaten by midnight predators.

Unquestionably the strangest and most interesting of these sea-bottom resters are parrotfishes, notably the rare and brilliant rainbow-parrot, *Pseudoscarus guacamai*. As soon as the last trickle of twilight has faded from clear tropical seas, it glides down to the purple shadows of the sandy bottom. Resting lightly on the tips of its ventral fins and tail, the parrotfish begins an odd ritual.

From its blue-green beak exude long, gossamer threads which it weaves, by the motion of its body, into a cobweb-like envelope that soon encases the entire fish. A little flap with a hole in its center covers the open mouth, and moves in and out as the fish breathes. Behind the caudal—or rear—fin there is another tiny opening through which expired water leaves. Thus the necessary flow of liquid over the gills is assured.

At first, the thin, transparent folds are difficult to see unless light rays are directed at an angle. Later, as the folds become thicker, the parrotfish disappears from view, and the envelope looks like a mere gelatinous mass that might be anything from a discarded egg case to some other useless bottom debris.

The exact formation of this marvelous envelope has not yet been observed, even by scientists working with captured parrotfish in an aquarium tank. During these aquarium experiments, it was found that an artificial light could not be left on for more than a few seconds—at intervals of five minutes—without the fish suspecting that daylight had returned and a nightgown would be superfluous.

While a parrotfish may spend a busy half-hour to an

hour, or more, preparing for bed, it can break out of its covers in less time. Even so, the escape is not easy. The mucous covering seems to be sufficiently resistant to slow the first early-morning swimming efforts. So, some backing and filling seem called for. In four out of seven observed attempts to free itself of the envelope, the fish succeeded by wriggling backward; twice it broke through the sides, and once it simply forged straight ahead.

With some species, the nightgown-weaving is apparently a normal, every-evening procedure, although one parrotfish, *Scarus brachiale*, does not form an envelope at all. And just to make it difficult for the fish experts, a few specimens were observed in their native haunts forming mucous envelopes around their bodies in broad daylight—possibly making practice runs!

Just what is the purpose of this nocturnal gown-weaving, a procedure, as far as is known, unique in Nature? Lacking a more complete scientific study of the creature, we can only surmise and wonder, says Dr. Howard E. Winn, of the University of Maryland, who made a detailed study of the phenomenon during the summer of 1954 at the Lerner Marine Laboratory, at Bimini, in the Bahamas. The diaphanous garments, thin as they are, may afford some sort of protection against night-prowling enemies. Also, Dr. Winn believes, they may protect the body from becoming surrounded by smothering silt. In some instances the mucus near the bottom had sand grains attached to it, and silt particles often settled on the upper parts.

The lack of any kind of light, which is usually necessary to the formation of the mucous envelope, leads some scientists to believe that there is a nervous control, leading from the eyes to the nervous system, and finally to the mucus cells. Another theory is that there may be less oxygen along the sea-bed, and this lack triggers the mucus cells. Obviously more research is needed here.

The nightgown-weaving habit is not confined to parrotfishes of the Bahamas area. Dr. John E. Randall, of the University of Miami's Marine Laboratory, observed the strange practice in mid-Pacific coastal areas, and in certain South Pacific island waters.

Gown-weaving is only one of the parrotfish's curious and unusual accomplishments. Colors of the males, for instance, become more and more brilliant as adulthood approaches. As they dart in and out of the blue depths along coral reefs, the parrotfish's rainbow hues of green, red, pink, blue and yellow recall macaws and parrots flying through tropical jungles. Females of some species, however, remain rather drab individuals throughout life.

The resemblance of parrotfish to the parrots of the bird world is heightened by the fish's curious teeth. These are solidly joined together to form a powerful

parrot-like beak, and thus the fish acquired its name.

"Many species of parrotfish," says Dr. Leonard P. Schultz, curator of fishes at the Smithsonian Institution's National Museum, "pass through from one to three color phases. In general, these are juvenile, in which the color may consist of two or three alternating dark and light streaks, or spots that are dark or mottled pale and dark; immature, in which the color pattern is usually some shade of red, brown, or purple; and adult, in which the pattern seems to be reached somewhat before or at sexual maturity, with the predominating colors generally green, blue, pink, red, orange and yellow."

"A few species are brownish. Some of these are females, but the males predominate in shades of green or blue, and with green teeth."

Such color changes make species classification extremely difficult. Living in the shelter of coral banks and reefs, and in most areas being somewhat secretive in their ways of life, parrotfish, or Scaridae, have remained one of the most baffling and confusing fish groups to marine biologists.

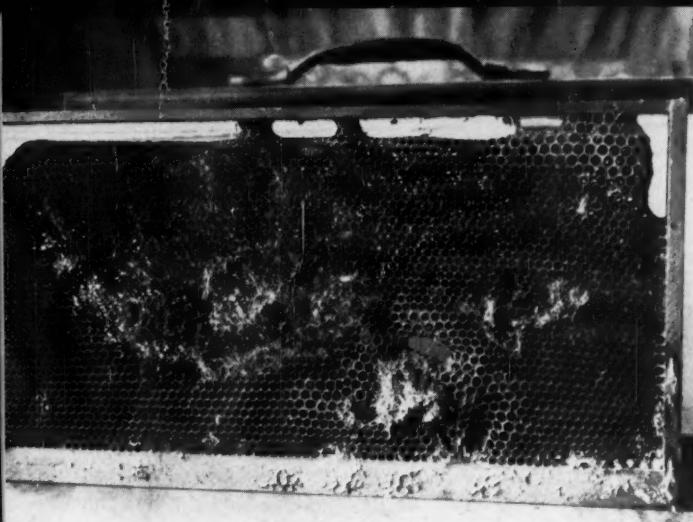
Untroubled by fine scientific distinctions, however, the layman skin-diver who joins the parrotfish in its reef-home element finds it one of the most fascinating fishes to observe and photograph. Even its feeding habits are different from those of other fishes. Parrotfish like to graze on stone and coral vegetation, like cows nibbling in a grassy meadow. With their sharp dental plates, parrotfish scrape the algae clean, occasionally snapping off coral fragments to get at fleshy polyps within.

Such a coarse diet calls for special grinding equipment, and Nature meets the need with the so-called pharyngeal mill, or teeth-in-the-throat. Designed to crush coralline algae, coral fragments, and other such marine roughage, the upper pharyngeal teeth are paired and fit snugly against the base of the skull. The lower set, a single bone, has a toothed surface. Powerful muscles, attached to the shoulder girdle and skull, quickly "make little ones out of big ones."

Captain Jacques-Ives Cousteau, famous French diver and director of Monaco's oceanographic institution, once observed a group of parrotfishes feeding in the Red Sea. "They were big fishes, more than a yard long, stockily built," he reports in the *National Geographic Magazine*. "From time to time they would charge against the coral. Their beaks would close in with a crunch, and a white scar would appear on the reef."

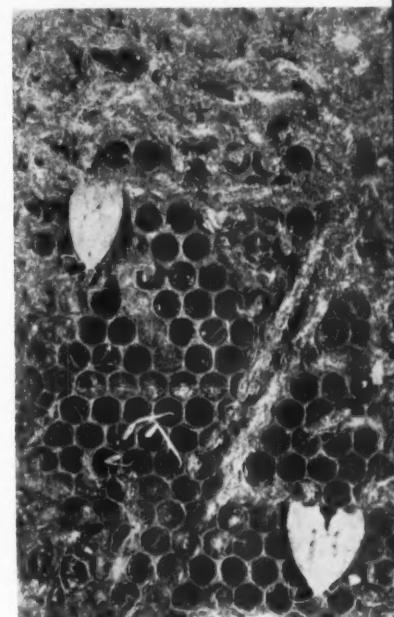
To obtain a tiny amount of assimilable living matter, Captain Cousteau concluded, they must swallow an enormous amount of coral. At the rate they were eating when watched, he estimated that each fish could consume ten tons of coral a year.

Aristotle once wrote that the (Continued on page 220)



The wax moth, an imported pest that first appeared in the United States at the beginning of the nineteenth century, now is found in every State. In the photograph at left, the larvae of the wax moth have begun their destruction of a honeycomb, and if undisturbed will eventually reduce it to a mass of webbing, excreta, and discarded wax.

A close-up view of an infested comb shows two adult greater wax moths and damage caused by moth larvae.



# The Curious Ways of the Wax Moth

By ROBERT J. WYNDHAM

Photographs by courtesy of Texas Agricultural Experiment Station



Larva of wax moth, 3X.

THE honey bee, *Apis mellifera*, has many natural enemies. In winter, field mice may invade its nest and destroy its combs while gorging with honey. Skunks visit bee colonies at night, scratch at the entrances, and eat the bees that come out to investigate the disturbance. Bears are fond of honey, and when they can get their claws into a bees' nest, they will destroy it. Then there are toads, birds, dragonflies, ants, spiders and yellow-jackets with which to contend. Destructive also is a bacillus that kills the bee larvae. But one of the most interesting enemies of the bees is the wax moth, sometimes called bee miller, or bee moth.

Two species are known; the larger one, *Galleria mellonella*, and the lesser wax moth, *Achroia grisella*. The first is the most important. There also are one or two smaller species of moths found in bees' nests that are not true wax moths. These smaller moths live on pollen, the protein food of the bees, and will not be considered in this article.

The larger wax moth lives as a parasite in the bee city. Of oriental origin, the insect has plagued bees since time immemorial. Aristotle tells of its damage, and early European writers mention the tiny moth as a terrible

pest. It is found in most European countries, India, and Australia, and it made its first appearance in the United States at the beginning of the nineteenth century. It now is found in all of the States. Evidently it enjoyed a free ride in a hive of bees entering the United States. For the honey bee, like the white man, originally was an immigrant. Stray swarms soon populated the hollow trees in forests throughout the country, and the wax moth inevitably followed the bees.

The greater wax moth, *Galleria mellonella*, measures up to five-eighths of an inch long, with a wing span of one and one-quarter inches. When its wings are folded—and it being a nocturnal creature we see it mostly that way—it appears ashy-gray. Its coloring is protective and resembles weather-beaten wood. The back third of the front wing is bronze colored. The front wings are covered with fine scales that rub off when the moth is touched. The hind wings are gray with traces of a few black lines. The body is brown and also is covered with scales. The male is slightly smaller than the female. The fore wing of the male is deeply scalloped on the outer margin, and the scallops sport a fringe of black hair. All in all, these moths are not wholly unattractive.



A row of wax moth cocoons has been cut open to show construction. A pupa is present in one of the cocoons.

six days. They lead a more active life, day and night. The moths in their adult, flying form are not known to eat.

At mating time—which, in true moth style, is at night—the males assume the active role; they “drum” with their wings, and the vibration of the wings sometimes produces a low hum. One investigator reports that the male wax moth can detect the smell of a female for distances of up to a mile. Evidently this faculty is one of those wise arrangements of Nature, for bees’ nests in the wild often are located far apart, and mating with a female living in the same bee colony might mean inbreeding.

The female begins laying eggs shortly after starting her life as an adult. Soon after dark she gets to work, and is so completely absorbed in her task that it is not easy to disturb her. Nervously she darts in and around the honeycombs. Her antennae vibrate all the time, perhaps helping to locate crevices in which to deposit her eggs. Her egg-laying tube—the ovipositor—is now extended. It is rather long, and quite slender. It moves constantly over the comb in search of suitable places to lay the eggs. Each time a good location is found, the ovipositor spreads at the top. Now the female braces herself to push the tube into the comb. Then there is a quick jerk of the abdomen, and a tiny egg is forced down the ovipositor and deposited.

The females seem to believe in large families,

The female moth emerges from the cocoon at night and immediately looks for a protected place in which to expand and dry her wings. By the next morning she is able to fly and to start her short life of twelve days. During the day the moths stay in sheltered and dark places. They draw their wings around their bodies and remain motionless. If disturbed during daylight, the moths take off on short, clumsy flights, as if blinded by the light. They will then settle down on the nearest object, seemingly happy to avoid further flight. Only late in their egg-laying period do the females show any activity during the daytime. The males emerge from their cocoons a few days earlier than the females, and their life span is about twenty-

and have been observed to lay an egg a minute for thirty minutes. Then, after taking a short “breather,” the moths returned to lay eggs at the same rate. The number of eggs found in the ovaries of a single female may range from eight hundred to a thousand, but in spite of such mass production, every egg is laid singly, and securely fastened to whatever object it is laid on. The moth takes about eight days to lay her full quota of eggs. Using up all her vitality in the laying process, the female is completely spent at the end of the laying period and dies while laying her last eggs—often with the last few eggs barely extruded from the laying tube.

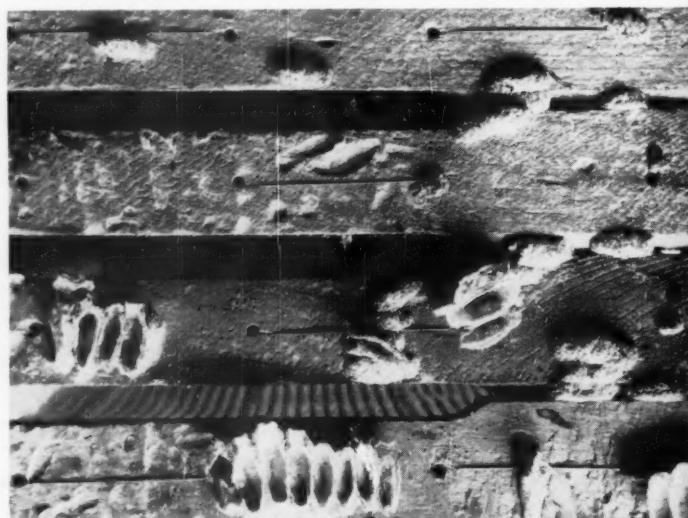
Nature has deeply ingrained the procreation instinct in her. If a female is fatally injured and not able to walk, she will try to lay her eggs even while dying. If the females do not have a chance to mate, they will still lay eggs. However, such unfertilized eggs will not hatch.

The eggs are off-white, elliptical in shape, and very small; about one-fiftieth of an inch in diameter. These eggs will hatch in ten to twelve days. About four days before hatching, the developing larva can be seen as a dark ring inside the shell. During the last twelve hours before the larva emerges from the egg, it clearly can be seen. Then it is busy cutting a hole in the eggshell. The larvae, or “worms,” are white and very small when hatched—only one-eighth of an inch long. After emerging from their shells, they are inactive for a short while, to dry and to prepare for their great demolition job.

Soon they may be seen hurrying over the combs, as if wanting to dig in before the bees can seize them. For, in their first few hours, they are at the mercy of their enemies.

Shortly after hatching, the larvae start to tunnel through the combs. The small pieces of wax that they tear off in the process provide them with their first meal, and the tunnels they dig give them protection and food

After completing its growth, the larva of the wax moth must find a place to spin a cocoon. It prefers a crevice or cavity, but if necessary will gnaw a depression in wood, as shown below.



Four days are required by the larvae of the greater wax moth to transform themselves into pupae like those at the right. Two weeks after the larvae start to spin their cocoons, the adult moth is ready to make its appearance and start a new life cycle.

at the same time. In a few days the larvae have reached the center of the comb—their destination. Then they leave their tunnels and eat holes in the bottoms of the cells. Traveling from cell to cell, they spin threads of a silky substance and soon these spines become so thick that they form a sort of gallery, providing the larvae protection from the bees. Using the gallery as headquarters, the larvae extend their feeding grounds all the time, nibbling away more and more comb. Wherever the larvae go, they spin the silk that protects them from enemy attack. Besides this silk, they leave behind particles of chewed wax and excrement, and soon the combs are reduced by the numerous larvae to a tangled mass of webbing, excreta and discarded wax.

In thirty-five to forty-five days—the larval life-span—the tiny "worm" grows to be about three-fourths of an inch long. The pointed head is small, while the body is now off-white to gray in color.

If the infestation of larvae is heavy enough to destroy most of the combs, the bee colony is doomed. The honeybees that were originally introduced in our country—in 1621—were black bees, also called German or Dutch bees. For some unexplained reason, the bees of this strain could not defend themselves effectively against the inroads of the wax moth larvae unless the colonies had a large population. Thousands and thousands of bee cities were completely wiped out by the voracious larvae. To realize the destructive power of the larvae, we would need to visualize man-sized termites eating away our own houses!

Much later, Italian bees were imported into this country. Italian bees know how to keep the larvae from attacking their precious combs. When the larvae do not confine themselves to eating the wax refuse on the bottom of the bees' nest, the Italian bees catch them and carry them outside. There the larvae die of exposure, or become a snack for birds.

Having completed its growth, a larva finds a place to spin a cocoon, preferring a crevice or narrow cavity where it will be safe from the bees. If necessary, the larva will gnaw a depression in wood. As soon as the location for its cocoon is prepared, the larva starts spinning silk thread around itself, starting above the head and working down the body. First a thin layer is spun to construct the framework of the cocoon, the framework being finished with soft and fluffy silk on the inside. The cocoon-spinning larva turns around within the cocoon several times during its construction. The exterior of the cocoon hardens to a parchment-like substance. In a little more than two days, the cocoon is completed, and the last act of the larva is to cut an incision in the head-end of the cocoon, so that the future



moth can liberate itself easily. The larva's work is done.

The encased larva now has become inactive, and its body shrinks. It takes four days to transform the larva into a pupa. Slowly its color changes to dark brown. Two weeks after the larva started to spin its cocoon, the adult moth is ready to make its appearance and start a new cycle. Where the climate is favorable, two or more generations come and go in a year, but where temperatures fall below 50°F., the moths are not active and the pupae hibernate in their cocoons.

In addition to the honeybee, the wax moth has other natural enemies. A small red ant, *Solenopsis*, kills both moths and larvae. The ants attack the moths during the day, when they are inactive. Crawling under the moth's wings, the ants eat away the abdomen and carry the pieces to their nest. The larvae are killed by the ants whenever they are not protected by their webs, and there are several other minor enemies of the species, also.

One may be inclined to wonder if Nature has assigned the wax moth to a merely destructive role. The answer is, by no means. When a bee colony has become extinct by foulbrood, a disease that kills the bee larvae, the combs are intact. Then the chances are that in spring a swarm of bees will settle down in the depopulated bee city, unaware of the deadly enemy that still infests the combs. A swarm choosing such a nest for a residence would be doomed.

The wax moth prevents such tragedies. When the bee colony becomes extinct from foulbrood infection, the wax moth takes over. In a short time it will completely destroy the death-carrying combs, so that they cannot be re-used by other bees. In that way, the little moth prevents a series of bee tragedies. For one swarm after another would have been destroyed in that disease-cursed nest!



# The Giant Orchid of Malaya

By S. V. O. SOMANADER

*Photograph by the Author*

ONE of the largest orchids known to botany is the giant orchid, *Grammatophyllum speciosum*, of Malaya. Although it is not indigenous to India and to Ceylon, where the author lives, it has been grown successfully at the Royal Botanical Gardens at Peradeniya, Ceylon, at an elevation of 1540 feet, where there is an annual rainfall of about eighty inches. Its native country is Malaya; but, as it thrives under favorable tropical conditions, it also is found in places like the Celebes Islands—at Macassar, for example—where it is grown on large trunks or stumps of trees that are in open situations.

This imposing epiphyte, or air-plant, has stout stems, each some five to ten feet long. A healthy clump may have as many as seventy stems. It possesses large, club-like pseudo-bulbs, oval in shape, that are specially designed by Nature to store reserves of food for difficult times.

Another noteworthy feature of the plant is that each leaf, shaped like a ribbon, is about two feet long and is flat, with a sheathing base. There are usually a hundred or more leaves on each stem. The flowers, which may last some four months without fading, are no less remarkable. Borne on long stalks that attain six feet in length, the blossoms are ochre-yellow in color, with blotches tinted with reddish, purple or chocolate streaks. The three-lobed lip, or labellum, is pale yellow. Showy and sweet-scented, each flower measures about six inches across.

The blossoms are borne on racemes; that is, they form a collection of stalked flowers growing sideways on a central axis, with the younger flowers on top and the older at the bottom. Each raceme is some six to nine feet tall, and may contain a hundred flowers. Thus a single flowering raceme may produce a remarkable spectacle.

A full-grown plant, under the most favorable conditions, may produce as many as twenty-six racemes, although the specimen at Peradeniya, Ceylon, never bore that many. It is interesting to note that the Peradeniya orchid, planted in 1850—more than a hundred years ago—flowered only after forty-eight years, as it is said to have been planted in the partial shade of the sur-



One of the largest orchids known to botany is the giant orchid of Malaya, whose showy, sweet-scented blossoms may measure six inches across. The giant orchid, *Grammatophyllum speciosum*, is an epiphyte, or plant that grows upon another plant without being parasitic upon it.

rounding trees. But when it was moved to a sunnier location, it flowered oftener and more profusely. The last two flowerings of this plant were in 1948 and 1952.

For other than tree-stump cultivation, the giant orchid may be grown on logs placed in circular beds, with the stems firmly lashed to the log. The beds should be filled with bricks, charcoal, bones, bark and sand. The plant seems partial to gravelly soil, and the *cabook*, or laterite gravel found in Ceylon, seems particularly suitable. The plant should be fertilized periodically with cow manure reduced to a liquid state, and watered liberally, especially during the hot and dry season when the orchid requires shade during mid-day hours. Care also should be taken to see that the bed in which the giant orchid is planted does not become waterlogged by heavy rains.

This orchid is seldom seen in hot-houses in countries of the temperate zones, and it is highly prized by English orchid growers. When the flowers that blossomed at the Ceylon Botanical Gardens in 1952 were flown to the Olympic flower show in England, it is little wonder that they created more than ordinary interest, and that they were the subject of great praise!



This is the south end of Water Street. The tower is the control center for the entire Watershed Exposition. Electronic speaker systems enable the operator to talk back and forth with visitors, and sound recordings also originate in the tower. In the foreground are soil boxes that demonstrate water infiltration in different types of soils, with various kinds of plant cover. A push-button device enables visitors to "make it rain" on the surface of each box, while labels tell the story of the value of keeping ground cover in good condition on our watersheds.



PHOTOGRAPH BY WYATT DAVIS

## Watershed in Action

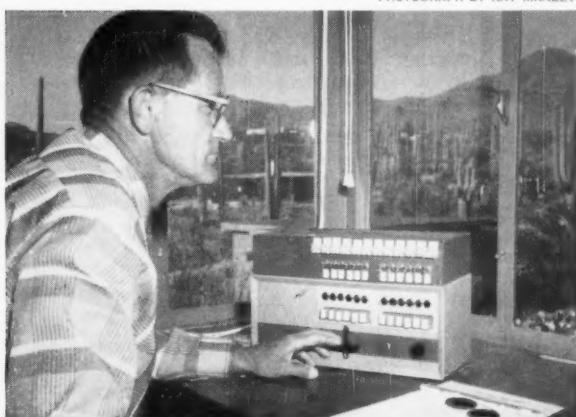
By WILLIAM H. CARR

"PRESS the button—make it rain!" "Press the button and learn how much water has evaporated from the surface of this tank since 8 o'clock this morning."

These invitations are typical of the labels before exhibits at the new two-acre Watershed Exposition recently opened at the Arizona-Sonora Desert Museum, near Tucson. There are many do-it-yourself invitations to learn about water infiltration in soil, soil temperature, erosion, floods and some thirty related subjects. More than 200 labels are required to interpret the demonstrations presented to the people of the Southwest and the

A speaker control panel in the tower enables Alan Blackburn to keep in touch with activities in the Exposition area. The panel operates all speaker units and the sound reproduction system. Mr. Blackburn was in charge of construction of the entire Watershed Exposition.

PHOTOGRAPH BY RAY MANLEY



Nation by Arthur N. Pack, President of the Charles Lathrop Pack Forestry Foundation.

Agencies cooperating in the building of the Exposition include the Forest Service and the Soil Conservation Service of the United States Department of Agriculture, the Watershed Management Department of the University of Arizona, the Armour Research Foundation of the University of Illinois and the Boyce Thompson Arboretum of Superior, Arizona.

The Arizona-Sonora Desert Museum, site of the Exposition, has been visited by more than a million people in the first six years of operation. This now self-supporting institution was established with private funds to show, in unique fashion, the living plants and animals in desert country of both Arizona and Sonora, Mexico.

One purpose of the watershed exhibit is to demonstrate, with actual scientific instrumentations, basic principles involved in watershed management in order to interest people in water conservation—a vital problem facing everyone. Another objective is to tell the dramatic story of the behavior of water and of the things that "happen" to it from the moment it falls upon the earth.

Two years in construction, the demonstrations are interpreted with signs, push button devices and with 90-second recorded messages over individual loud speakers. These loud speakers also serve as microphones to enable visitors to ask questions. An operator in a control tower can hear the questions, and by moving a lever, answer them through the same microphone.

A good way to describe the exhibits is through the use of photographs. The pictures shown on these pages attempt to give something of the scope and detail of the Watershed Exposition.





PHOTOGRAPH BY HIRAM PARENT

The watershed ramada. As visitors enter the Exposition grounds, loud speakers present a two-minute talk designed to orient both groups and individuals, and to explain "things to come." The group here is looking at a relief model of the State of Arizona that tells of various water provinces throughout the region.



PHOTOGRAPH BY RAY MANLEY

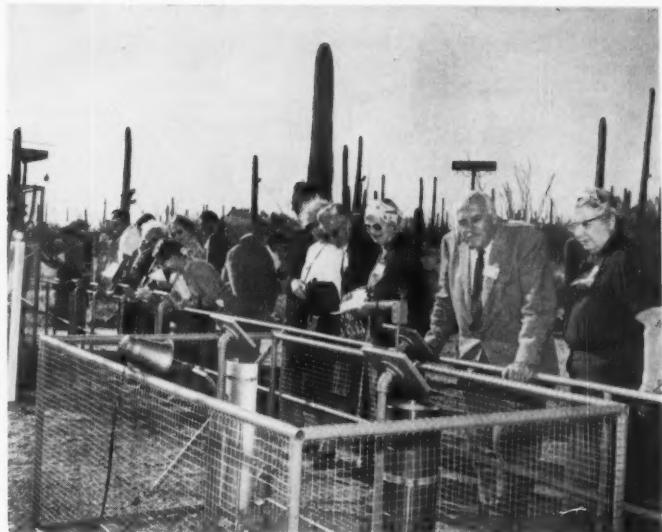
Soil profiles have been installed by the U. S. Soil Conservation Service. Different types of soil in both cross-section and in flat serve to impress the visitor with the fact that some soils may be easily penetrated by water, while others practically exclude water due to solidity of material. Stressed is the fact that top soil must be kept in good condition to enable plant roots to prevent erosion.



PHOTOGRAPH BY HIRAM PARENT

Visitors on Water Street are shown examining the demonstration devices that are housed in protective cages.

At the rain-gauge exhibit, visitors are listening to a story coming over the loud-speaker at the left. This section of the rain-gauge display tells how scientists measure the amount of rainfall. The message says that it is of vital consequence to know the answer to the question "how much rain?"



PHOTOGRAPH BY RAY MANLEY

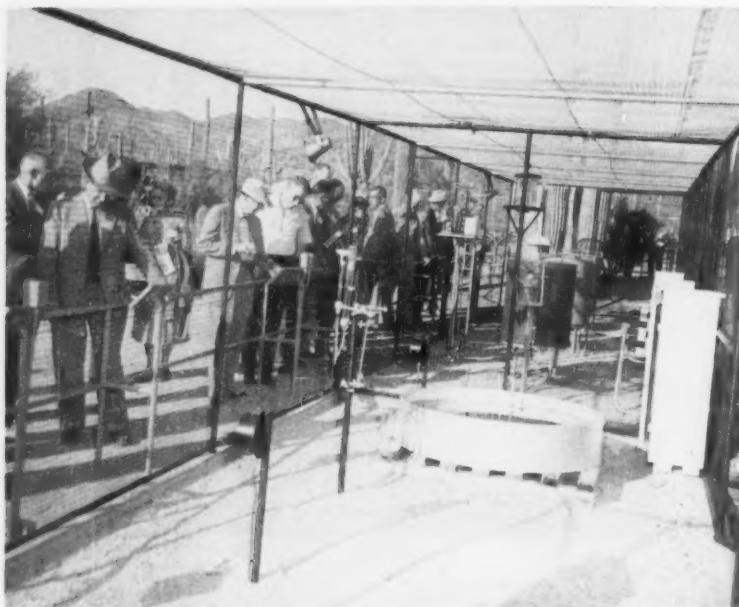


PHOTOGRAPH BY RAY MANLEY

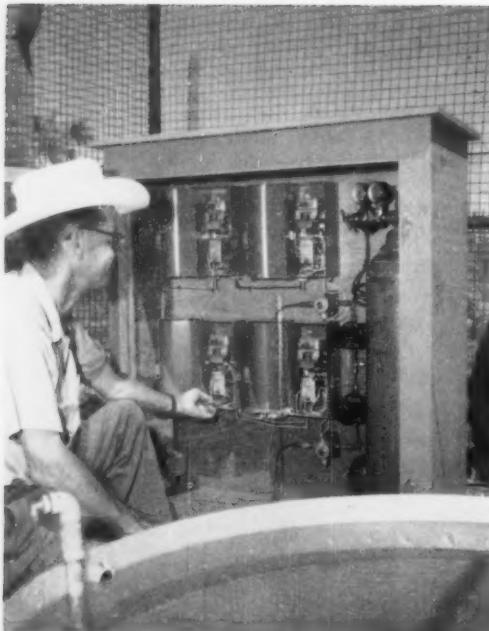
Everett L. Hamilton, the man at right in photograph, describes a telemetering rain gauge. Visitors some distance away push a button, look in a telescope, and watch "rain" fall into the tipping bucket. Every time the bucket tips, a radio signal flashes a light beside the visitor and indicates the measuring of two-hundredths of an inch of rain. Many of the electronic instrumentations for the Watershed Exposition were developed by Mr. Hamilton, whose aid and advice proved invaluable. He is a retired hydrologist of the U. S. Forest Service.

At the drop tower, flashing lights, revolving counters, loud-speaker message and person-to-person contact all help tell the story of the power of single drops of water. Forty drops per minute here fall upon three different types of soil. The first plot is well covered with grass; the second is sparsely covered, and the third is bare soil. Erosion effects vary accordingly.





Illustrated is a section of the evaporation exhibit, where three different tanks tell the story of daily, weekly and monthly evaporation amounts in response to the pushing of buttons. The enormous amount of water loss through evaporation is stressed here and elsewhere on the Exposition grounds.



PHOTOGRAPH BY WYATT DAVIS

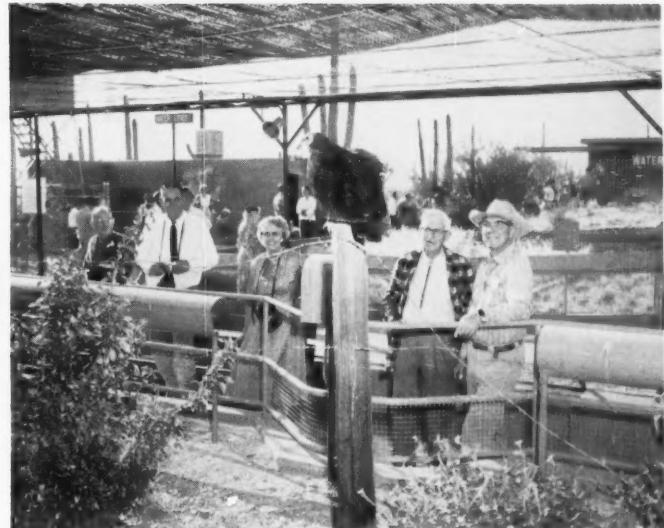
This is the control equipment of the evaporation tanks. In order to make it possible for visitors to operate dials giving evaporation amounts, it was necessary to install a "breaker" and gas system. When a button is pushed, gas is automatically sent into the tank, activating the dial that gives the information. The switches then turn off the equipment, making it ready for the next button-pusher.

PHOTOGRAPH BY RAY MANLEY



At the soil moisture exhibit, soil moisture measuring elements are buried in the soil from 6 inches to 4 feet deep. When visitors push buttons on these devices, a dial needle indicates the percentage of moisture at varying depths. The fact stressed here is that it is important for ecologists to know something about the penetration of moisture in soil.

The watershed exhibit has two large walk-in bird cages. The first contains birds and plants of the Sonoran desert, where there is an average rainfall of 11 inches per year and a temperature variation of some 95 degrees. The second represents an area in Sonora, Mexico, where there is a much higher rainfall and less temperature variation. Birds and plants typical of the region are shown in the second cage. These exhibits demonstrate adaptation of different species to variations in climate and location.



PHOTOGRAPH BY RAY MANLEY



The telemeter weather station was built by the Armour Foundation, and transmits weather data from a remote site by radio. The upper dials receive information from a distant point on wind direction, wind velocity and soil temperature. The lower dial duplicates this information from a point immediately adjacent to the installation. A comparison of data from both sites enables visitors to note the difference. At the right is Jack Althouse, inventor and builder of the machine, which sends its messages in similar fashion to the sending equipment in the nose cones of rockets.

The telemeter transmitting equipment, located on a mountain outside the museum area, may be viewed through a telescope mounted beside a receiver in the watershed area. Solar batteries operate the sending devices. A "beep" tone at the receiving end intrigues children and calls their attention to the exhibit, which stresses the importance of knowing all facts possible regarding the influence of natural phenomena on the welfare of the land.



PHOTOGRAPH BY WYATT DAVIS

# Trees in Flower



The white or purple-tinted flowers of catalpa are crowded in erect, dense clusters that conceal much of the green foliage.



The greenish-yellow flowers of the silver maple open on warm days in late winter.



Tiny male flowers of black willow are in drooping catkins that appear on the bare branches. Female catkins are slenderer.



The milk-white, fragrant, pea-like flowers of black locust droop on slender stalks in mid-spring.



TREE flowers often are overlooked because they are usually small and inconspicuous. Many last only a few days, and we are reminded of them when we see the parts that do not go into the formation of the seed scattered in great profusion on the ground. Tree flowers generally grow in clusters, and those of some species may be particularly attractive, as, for example, the black locust, catalpa, buckeye and black cherry. Some tree flowers that grow singly are conspicuous; those of the tulip tree are erect and brightly colored, and magnolia flowers are large and showy. Dogwood flowers are small, and are crowded in a flat cluster that is surrounded by the large and conspicuous leaf bracts sometimes mistaken for flowers.

One of the most common arrangements for tree flowers is in catkins, or aments, in which the individual flowers are closely attached to a central stem, each catkin being made up entirely of male or female flowers.

The willows, cottonwoods and birches have both male catkins, made up of staminate or pollen-bearing flowers, and female catkins, made up of seed-producing flowers. In the walnuts, hickories and oaks the male or staminate flowers are in catkins and the female or pistillate flowers are inconspicuous, occurring either singly or in small groups.

Maple flowers are in long- or short-stemmed clusters. In one species of maple, the box elder, male and female

The yellowish flowers of the buckeye grow in large, pyramid-shaped clusters, standing erect at the ends of the branches.



## By WARREN D. BRUSH

*Photographs by the Author*

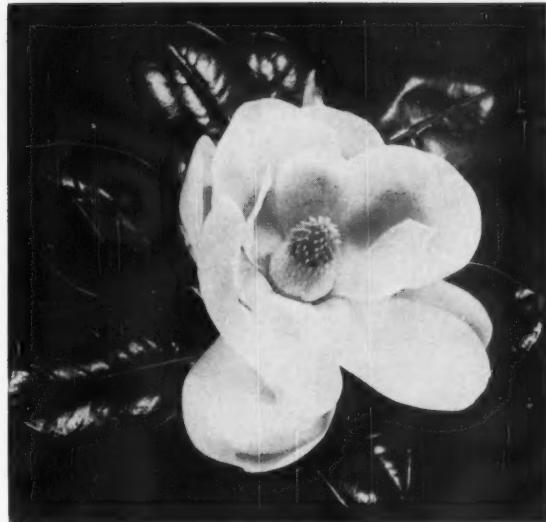
flowers are on separate trees. The flowers of the ash are in feathery clusters, and in most species the male and female are on separate trees. The minute sycamore male and female flowers are in separate spherical heads.

The elm flower has both male and female parts. It is small and inconspicuous, but elm flowers are borne in such profusion as to give a hazy appearance to the tree.

Flowers are valuable in tree identification because they often bloom before the leaves are out. In the case of the oaks and some other species groups, flowers do not serve to identify the individual species as does the fruit.

To many, the scarlet flowers of red maple are the first sign of spring. Other trees that flower in March are the birches, and toward the end of the month the purplish-pink pea-like blossoms of the redbud or Judas tree. Even before these the dull, greenish-yellow flowers of silver maple open on sunny, warm days of late winter. April is the usual month in which the dogwood clothes the hillsides with white. At this time the twigs of the willow and cottonwood trees are covered with catkins of both sexes, and the little elm flowers appear in the greatest profusion. Other maples—sugar, Norway and box elder—start to bloom as the leaves unfold. The inconspicuous flowers of ash develop along with the leaves, as also do the catkins of the oaks, the hickories and black walnut.

In May the sycamore flowers and the showy blooms of buckeye and magnolia appear, followed by those of the tulip tree and black cherry. In June, when the flowers of black locust, catalpa and basswood make their appearance, many of the leaves are fully formed. ♀ ♀



Conspicuous are the fragrant white magnolia blossoms, often seven to eight inches across, that are borne at the ends of the branches against a background of glossy green leaves.

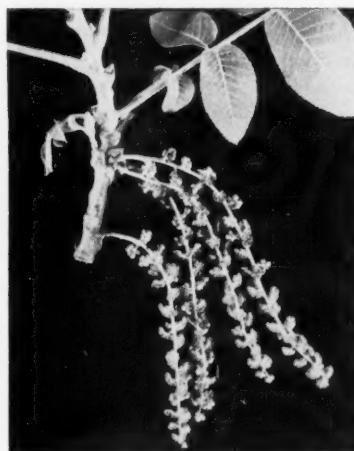


During May and June the wild black cherry is clothed with myriad small white flowers in cylindrical, drooping clusters.

Male hickory flowers are in long, slender, drooping aments occurring in threes. The female flowers are in inconspicuous small groups.

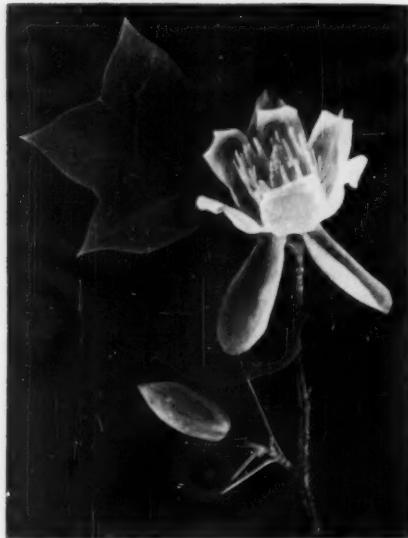


Black walnut flowers mature as leaves unfold in long drooping catkins. Female flowers are single or in small groups on twig.

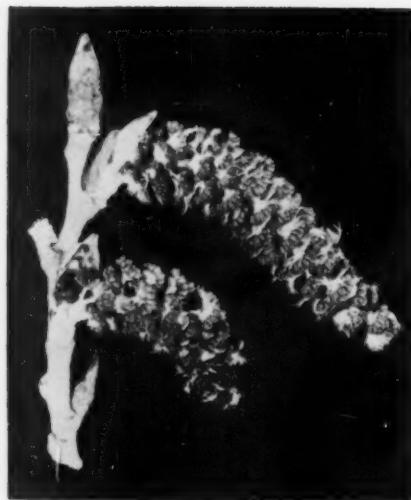
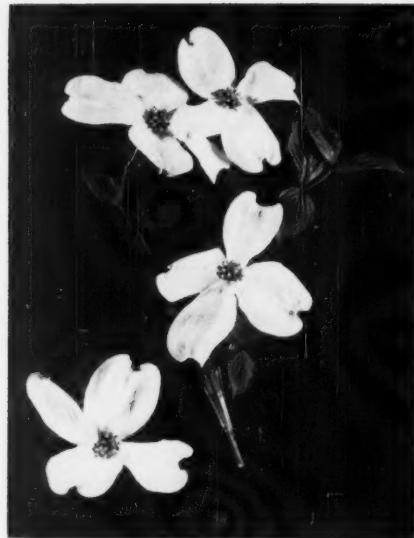


Male oak flowers generally appear with leaves in slender stringy catkins. Tiny female flowers grow singly or in compact groups.

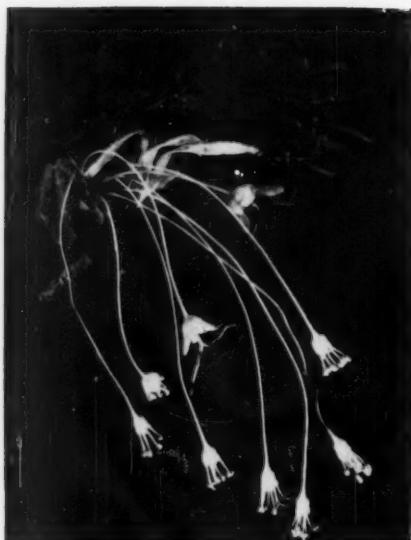




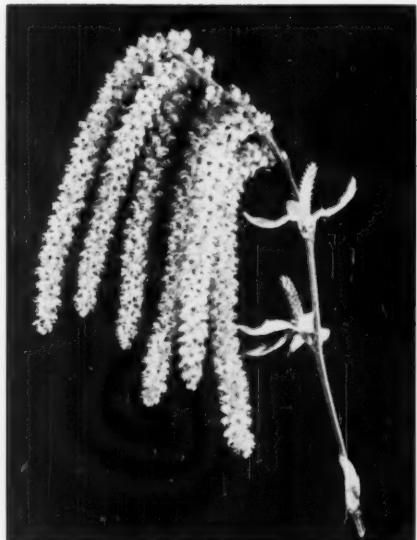
The dogwood's early-spring display is due to conspicuous petal-like bracts that surround a cluster of small flowers.



In the cottonwood, the densely-flowered, thick male catkins appear on the bare branches. Female catkins are slenderer.



In early spring before leaves appear, male flowers of the birches lengthen and hang from tips of twigs. Female catkins shown are smaller.



Slender-stemmed flowers of the sugar maple hang from the ends of the twigs, both sexes often being found in the same cluster.





## "High-Sign Offered to Beat U. S. Outdoor Rules"

This is the headline over a story in *Advertising Age*, illustrated by a picture of the sign shown above. The story reports that this advertising "spectacular" is called "Land-Mark Hi-Sign" and is patented by Land-Mark Advertising. The structure is one hundred feet wide and eighty feet high. It has a space area twenty-four times that of a twenty-four-sheet poster board, and was put up at Romulus, Michigan, a suburb of Detroit.

"It can be set up 2000 feet from a highway and still be visible on the highway at great distances," says the sales promoter of the sign. "Just one sign can represent a powerful appeal in many market areas, and can have a dominating effect in large market areas. It can be placed well beyond the setback requirements along most highways and not jeopardize its visibility or readability."

We realize, of course, that the outdoor advertising industry has been at great pains to convince both advertiser and advertising agency that the Federal law designed to restrict billboards and passed by the 85th Congress, was enacted at the behest of "a few misguided garden club women." This phrase, with variations, is used by the outdoor advertising industry to dis-

miss the importance of the proponents of protection of our Interstate Highway System. The industry hopes that the advertiser will not read the record and discover that, while a substantial army of women *did* foster this legislation, they were joined by automobile clubs, sportsmen's and outdoor organizations, planners, architects, landscape architects, nurserymen, and just plain people. All of these citizens want safe and pleasurable driving over the immensely costly new highway system.

It would seem to us, just as a matter of simple public relations, unwise for advertisers to defy such a considerable body of potential customers. And when someone comes along with such a monstrosity as is pictured above, baldly designed to circumvent the wishes of a great many people, it strikes us as even worse judgment. We do not believe that the American people want to be "dominated" by such a structure and its message.

Legislation is being, or will be, sought in most of the States to protect their mileage of the Interstate System. Perhaps, in fact, we may be wrong in condemning this "Hi-Sign," because such defiance of the public will may well make voters and legislators mad enough really to crack down on an industry that exists largely by virtue of its parasitism of the public investment in highways.



# The Wegener Woods

By JAMES P. JACKSON

*Photograph by the Author*

The Wegener Woods at Holstein, east-central Missouri, is a remnant of the virgin oak-hickory forest that covered the area in the pioneer days of America. Foresters and ecologists have been puzzled, however, by the increasing prominence of the sugar maple in Wegener Woods, supposedly an oak-hickory climax forest.

**I**N THE late years of his life, Daniel Boone lived among the timbered hills of east-central Missouri. Today in this region there is only one small reminder of the trackless forests that Boone knew so well. It is Wegener Woods, a remnant of early American forest situated at Holstein, Missouri, about ten miles from Boone's original burial place.

Wegener Woods is named after its present owner, Ben Wegener, who is a retired farmer. To date, no living tree ever has been cut from the premises, and it is the only virgin hardwood forest within a wide area.

The first observation to be made on entering this forest is its open aspect; it is almost free from undergrowth. Here and there, as where a great tree has died or at the place where a 1954 tornado dipped its funnel, the conditions are different. For, in these natural openings, the sunlight pours in and the undergrowth is lush.

The heavy summer shade and the thick carpet of leaf-litter on the ground seem to have limiting effects on most smaller plants of the forest. In March and early April, however, wildflowers make their brief appearances to adorn the carpet before a green roof closes in. Bloodroot, Dutchman's breeches, jack-in-the-pulpit and May-apple are but a few that typify the early spring flora of the Woods.

Although Wegener Woods lacks the brushy cover necessary for some kinds of wildlife, it does seem well suited to many species of birds. Summer residents like wood pewees, wood thrushes, summer tanagers and red-eyed vireos each have limited ranges, all apparently within the forty-acre tract. In addition, there are

bluejays, tufted titmice, chickadees, white-breasted nuthatches and woodpeckers that find the forest attractive at any time.

Because of the aged trees with their dead, gnarled branches, woodpeckers are numerous in Wegener Woods. It is the usual headquarters for a pair of pileated woodpeckers, locally known as "wood hens." The sound of their cadenced calls and the sight of oval excavations are constant reminders of their presence. Other year-around residents of the bird clan are the flicker, the red-bellied and the red-headed woodpeckers.

Oak-hickory forests are considered by ecologists to be climax, and more or less permanent for the mid-West. But they do vary in composition, depending on various local factors of soil and topography. It so happens that Wegener Woods has a predominance of white oaks, and the many fine specimens of this species rule the arboreal roost. Many are between two and three hundred years old and a few—a very few—are living past the three-century mark. As to size, the massive boles of these patriarchs range up to four feet in diameter.

Scattered throughout the tract are some large black and northern red oaks, but compared to the white oaks they are lesser trees, both in size and number. The co-dominants of the oaks include shagbark, mockernut, and black (pignut) hickories, although no one species is abundant. Of the remaining old-growth trees most are white ash—some more than three feet in diameter—with less than a dozen choice black walnuts scattered about.

There is one more tree of importance in the tract. It is the sugar maple, the enigma of Wegener Woods.

The mystery lies in its ever-increasing numbers and prominence, despite what is supposedly an oak-hickory climax forest.

Sugar maple in a forest is always fairly tolerant of shade and competition. When old trees die, the many young maples make the upward thrust to vie for a share of the sky. But in this forest the species seems to dominate all others in seedling production. During the present decade there have been no signs of successful oak reproduction in Wegener Woods. The youngest white oaks to have survived the seedling stage are now at least thirty years old and are nearing six inches in diameter.

Unfortunately, a number of white and black oaks succumbed to the great drought of 1952-1956. Mr. Wegener, no waster of good wood, had the trunks of several dead giants removed for various uses. Although not materially damaging the tract, this salvage opera-

tion did create small clearings that grew into tangles of undergrowth, including the seedlings of various trees. But tiny oaks were not among these even though foresters had recorded excellent acorn crops in recent years.

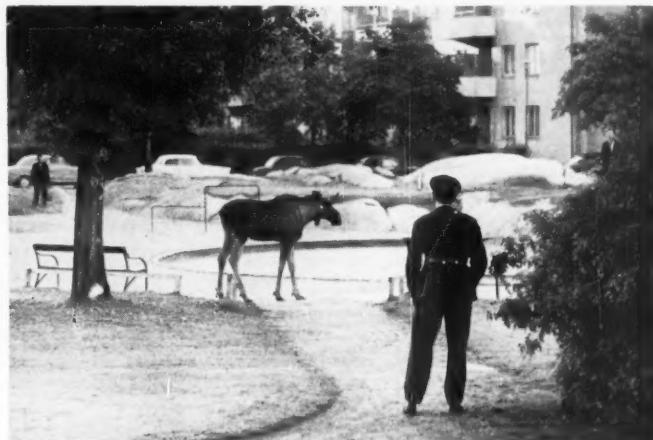
The foresters also have studied other aspects of Wegener Woods ecology. In fact, Missouri University's School of Forestry cherishes the forty acres as one of its favorite study areas. Its experts have not yet solved the puzzle of the encroaching maples and the scarcity of new oaks. But if the forest remains undisturbed it has the potential to answer many questions and reveal many lessons in ecology. Wegener Woods also helps us to realize what natural wealth and beauty confronted early pioneers like Daniel Boone. For these reasons it is one of the choice areas under the watchful eyes of Missouri's new Nature Conservancy chapter, which hopes that Mr. Wegener also will want it preserved. ♣ ♣ ♣

## A Visit to the City

Photograph by courtesy of  
American Swedish News Exchange, Inc.

ONE MORNING not long ago an early-rising apartment dweller in the city of Stockholm, Sweden, was more than a little surprised to see, through the window, a young moose grazing in one of the city's public parks. The tenant put in a call to the police, who dispatched two radio patrol cars to the scene. For the next forty-five minutes the big mammal led the police on a chase through the city, the moose stubbornly attempting to graze, and the police stubbornly resisting its effort.

After a while the police were able to convince their



Both the young moose and the city policeman seem to wonder what the next move will be after the big mammal's grazing is interrupted.

persistent visitor that city life was not worth the trouble. The big animal returned to the forest, the police returned to the police station, and early-morning life in Stockholm settled back into its ordinary routine.

### ACTIVE PURPOSE

*I ride my thought with might and main  
Along with silver tacks of rain  
And wings of birds that venture forth  
In slow migrations to the north.  
I send a word to Vega, Mars,  
And scoop a bucket of the stars.  
This is a daily conference  
That I have with the present tense  
Before verbs are imperfect, past,  
And light-yeared sleep is mine at last.*

Daniel Smythe

*An early student  
of American natural history was*

# Mark Catesby

By W. L. McATEE

**S**INCE THERE is comparatively little to be said about Mark Catesby the man, we may better dwell upon the book that entitles him to a place among authors of great works on American ornithology. It was the first book on American birds that was illustrated by colored plates. It was in the grand style, imitated by numerous authors for a variety of subject and diverse lands, and was hailed at the time of its appearance as the most

magnificent work since the art of printing had been discovered.

Such praise probably was inspired chiefly by the illustrations, but a word can well be said for the quality of the paper the bookmakers used then. It puts to shame the bulk of that now made into books and, despite two hundred years of aging, will remain fair and firm when most of the modern product has moldered away.

All editions of Catesby's *Carolina* have been examined by the writer, but only the third—the edition of 1771—is now at hand; its two volumes measure fifteen by twenty-one inches, are two inches thick, and weigh about ten pounds each. The impressed surface of the plates is about ten by fourteen inches, permitting life-size representation of many birds and adequate illustration of nearly all of those attempted.

Judged by present high standards of bird portraiture, Catesby's pictures are only fair; nonetheless, a high proportion of them are identifiable. He was primarily a botanist, and the illustrations of plants presented in many of the plates average better than those of the birds. Many fishes and numerous mammals, insects, and other creatures also are figured.

He used dead-bird poses for a few illustrations, including the robin, summer tanager, and yellowrump, but devised more or less life-like attitudes for the majority. Among the best illustrations are those of the little blue heron, scarlet ibis, wood

THE  
NATURAL HISTORY  
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BIRDS, BEASTS, FISHES, SERPENTS, INSECTS, and PLANTS:  
Particularly, the FOREST-TREES, SHRUBS, and other PLANTS, not hitherto described,  
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Is Prefixed a new and correct Map of the Countries Treated of.  
B Y  
MARK CATESBY, F.R.S.

VOL I  
HISTOIRE NATURELLE  
DE  
La CAROLINE, la FLORIDE, & les ISLES BAHAMA:  
Contenant les DÉSSINS  
Des OISEAUX, ANIMAUX, POISSONS, SERPENTS, INSECTES, & PLANTES  
Et en particulier,  
Des ARBRES des Forêts, ARBRETTAUX, & autres PLANTES, qui n'ont point été décrits,  
jusques à présent par les Auteurs, ou peu exactement définies.  
avec leur Description en François & en Anglais.  
A quoi on a ajouté,  
Des Observations sur l'Air, le Sol, & les Eaux.  
Avec des Remarques sur l'Agriculture, les Grains, les Légumes, les Racines, &c.  
Le tout est précédé d'une CARTE nouvelle & exacte des Pays dont ils s'agit.  
Par MARC CATESBY, de la Société Royale.

TOME I

LONDON:

Printed at the Expence of the AUTHOR: and Sold by W. INNIS and R. MARSH, at the West End of  
St. Paul's, by M. HAUSSER at the Royal Society House, and by the AUTHOR, at Mr. BACON'S  
in Holborn.

MDCCXXXI.

This is the title page of Mark Catesby's *Natural History*, the text of which was printed in parallel columns of English and French.

duck, and blue-winged teal. A few are so poor as to be unidentifiable, as those he calls the little thrush, little sparrow, and yellowrump. Of ninety-four birds of the United States figured, two were mixtures, three unidentifiable, and four duplicates, leaving a net of eighty-five. Records not accompanied by illustrations bring his total of North American species to a round 100.

For most of his species he provided English names, many of which are in use today, and Linnaeus, the nomenclature reformer, based technical appellations of both plants and animals on the Catesby plates, so

that the book is fundamental in several branches of American natural history. Owing to Catesby's use of Charleston as headquarters, fifty-eight species of birds alone are now regarded as having their type, or original, locality in South Carolina.

Authors who gave scientific designations to animals and plants illustrated by Catesby did not forget to name some of them for him, and others have been independently dedicated to Catesby. Available indexes do not facilitate the finding of plants that have been so named, but the total of animals can be made out as about fifteen, and includes representatives of the foraminifer, spider, fish, frog, snake, bird, and mammal alliances. Almost every author had a different idea as to latinizing the name Catesby, and one gave up entirely, using the word just as it is spelled in English.

Catesby's accounts of the birds are mostly descriptive, but sometimes include notes on distribution and habits or on other matters. He found the yellow-breasted chat and the indigo bird only in somewhat elevated districts, and remarked of a trip to the mountains: "I was much delighted to see nature differ in these Upper Parts, and to find here abundance of things not to be seen in the lower parts of the Country." On the strength of this, Witmer Stone wrote that Catesby gave "us one of the first intimations of the effect of altitude upon geographic distribution."

The popularity of the purple martin already had been established, and Catesby wrote that these birds "breed in Lockers prepared for them against houses and in gourds hung on poles for them to build in; they being of great use about houses and yards, for pursuing and chasing away Crows, Hawks, and other vermin, from the Poultry." A bit of folklore was recorded about parakeets: "Their guts are certain and speedy poison to Cats."

He gave the eagle and fish hawk story with a twist of his own, although I doubt that this phenomenon is as prevalent as might be suggested from the frequency with which it is mentioned in books. In sixty years of bird watching—at times in very favorable places—I have never seen it. However, witness Catesby: "The Fishing Hawk plunges into the water and seldom rises without a fish; which the Bald Eagle... generally on the watch, no sooner spies, but at him furiously flies; the Hawk mounts, screaming out, but the Eagle always soars above him, and compels the Hawk to let it fall, which the Eagle seldom fails of catching, before it reaches the water. It is remarkable, that whenever the Hawk catches a fish, he calls, as it were, for the Eagle; who always obeys the call, if within hearing."

*The Natural History of Carolina, Florida and the Bahama Islands*, the full title of which is much longer, was

printed in parallel columns of English and French. Considering the size of the work, Catesby must have had a true friend, as he wrote that the French translation was done by "a Doctor of Physick, and a Frenchman born, whose Modesty will not permit me to mention his name." The work was issued in parts, each containing twenty plates with pertinent text, the first volume appearing in 1730 to 1732, and the second in 1743 to 1748. Editions with the contents somewhat rearranged, but otherwise little altered or augmented by the naturalist-editor, George Edwards, were issued in 1754 and 1771. The work also was reproduced in other West European languages.

The author has been termed "the elusive Mr. Catesby," and for long the principal facts of his career were a mystery. Much was done to flesh the skeleton of Catesbyan biography by Dr. Elsa G. Allen, through personal research in his natal region. She established that he was born in a village in Essex, England, March 24, 1682. While births are often a matter of record, many subsequent events are not,

so little is known about Catesby's education, and it is only presumed that he went to London on account of the opportunities for the study of natural history. It seems that he must have become acquainted with persons of botanical interests, and that his first trip to America was financed by his father. Catesby, himself, wrote of the trip: "My Curiosity was such, that not being content with contemplating the Products of our own Country, I soon imbibed a passionate desire of viewing as well the Animal and Vegetable productions in their native countries, which were strangers to *England*. *Virginia* was the Place, as I had relations there, which suited most with my Convenience to go to, where I arriv'd the 23d of April 1712." He was then twenty years of age. The "relations" were a sister and a niece, both wives of prominent people, the former having married Dr. William Cocke, secretary to the Governor.

At any rate, conditions were congenial, as he remained until 1719. He also traveled in Maryland, and ascended the James River to its headwaters. He sent seeds and plants to friends in England, where he returned with the largest collection of plants that had been made in the New World up to that time.

In the course of studying this material, Catesby made the acquaintance of a number of botanists, one of whom, William Sherard, urged him to make another trip to America for more strictly scientific purposes. There was nothing that Catesby would have liked better, so with the sponsorship of a dozen leading scientists and others, including Sherard, he started on his second voyage in 1722, arriving in Charleston on May 23.

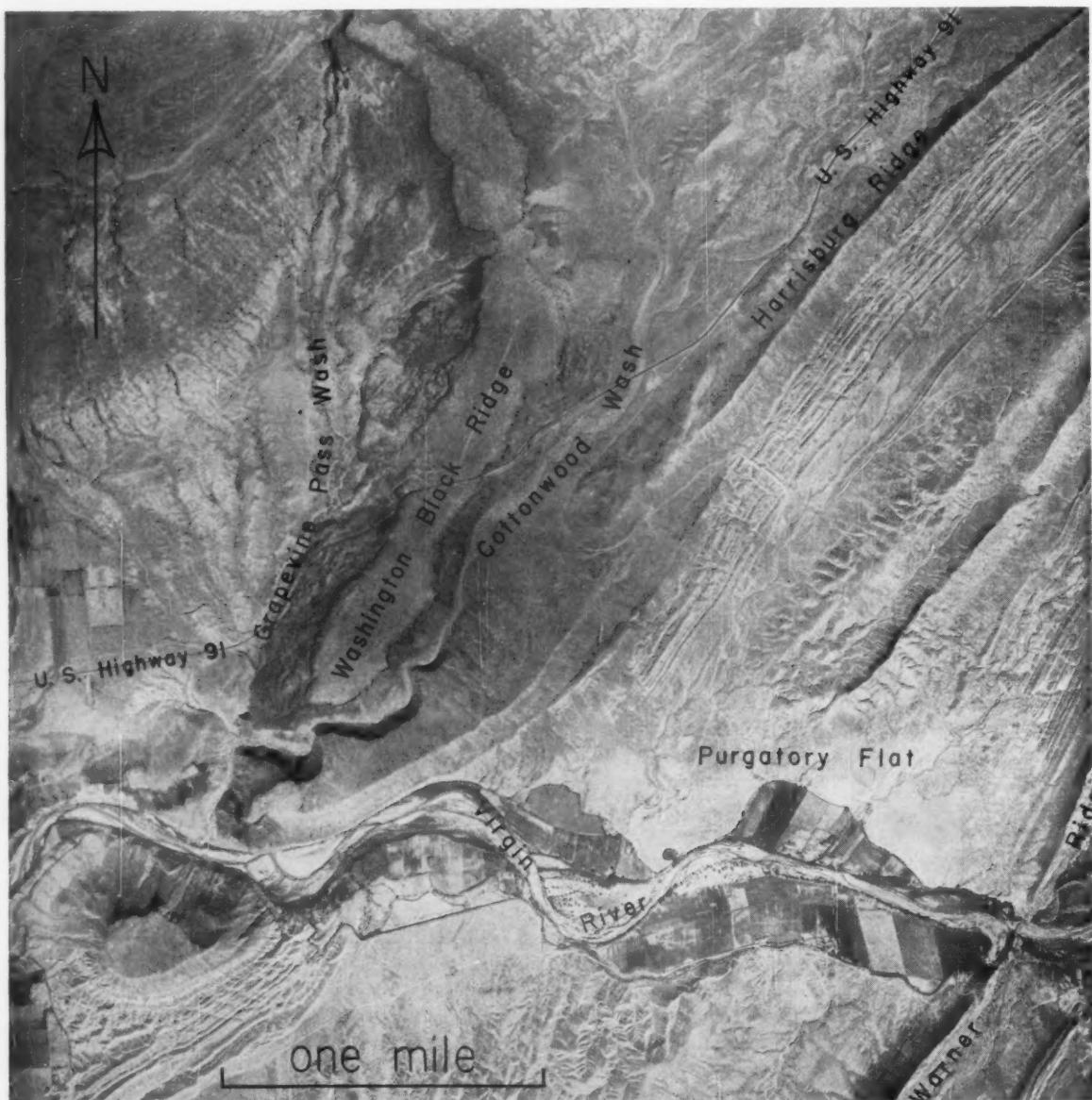
He spent the first year in the (Continued on page 220)

# Mountains Upside Down

By RICHARD L. THREET

The aerial photograph below looks directly downward on two types of "mountains upside down" along U. S. Highway 91 in southwestern Utah. The sinuous Washington Black Ridge is capped by the remnant of a lava flow that filled the former valley of Grapevine Pass Wash. As the ancient Grapevine Pass Wash and its tributaries eroded away the former valley sides faster than the lava-armored valley bottom, Washington Black Ridge was left standing in relief as a valley "downside up." As the Virgin River and its tributaries have cut down through the hard sandstone arch of the Virgin anticline and slowly hollowed out the soft shale beneath, there has been developed a broad lowland (Purgatory Flat) where the sandstone was once in the highest part of the arch, and a pair of high ridges (Harrisburg Ridge and Warner Ridge) where the sandstone was once relatively low.

PHOTOGRAPH COURTESY COMMODITY STABILIZATION SERVICE

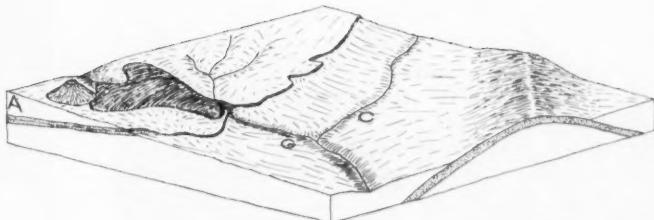


LONG the heavily-traveled Arrowhead Trail—U. S. Highway 91—from Los Angeles to Salt Lake City, there is no more spectacularly colorful scenery than that of Utah's "Dixie," where cotton was grown during early Mormon days. Near the villages of St. George and Washington there are impressive, naked ridges of brilliantly red shale and sandstone capped by thin layers of coal-black basaltic lava. This arresting scenery imparts an even more lasting impression when it is discovered that these ridges are "mountains upside down," or really *valleys downside up!* Where each ridge now stands, liquid lava once flowed along the flat bottom of a valley previously carved into the widespread red strata of the local bedrock. The lava streams have long since hardened, but they can be traced back northward to their now-extinct and deeply eroded volcanic sources on the flanks of the Pine Valley Mountains.

As the selective fingers of cloudburst streams clawed at all parts of that ancient landscape, the soft red rocks of the valley sides were worn down faster than those protected under the armor plate of lava. The former streams and their tributaries were gradually reversed and diverted to the lowlands developing where the divides once stood. The streams must now proceed to consume the remaining ridges by gnawing headward into the slopes of red shale, slowly undermining the hard caprock of basalt. Using the best available estimates of geologic age, it seems that this case of "inversion of relief" has required at least several tens of thousands of years for development.

Such upside-down features are common, and take a variety of forms in landscapes of all parts of the world. One type similar to that in southwestern Utah, but of considerable economic importance, is found at several places along the west slope of the Sierra Nevada in central California. During the gold rush of the "forty-niners," much placer gold was found in the gravelly beds of streams that had cut deep canyons into the gently sloping top of the mountain block. But especially rich sources of placer gold were found as ancient placers in old stream gravels protected under lava caprock on the present divides—lava that had flowed down ancient valleys carved into the old mountain block, becoming an armor responsible for subsequent inversion of relief.

In still other areas, where hard and soft strata have been corrugated by pressures of mountain building, the up-arched anticlinal portions are usually more vulnerable to erosion than are the down-folded synclinal portions. After thousands or millions of years of differential ero-



SKETCHES BY THE AUTHOR

The generalized block diagrams above and below show the sequence of events in the development of the "mountains upside down" near Washington, Utah. The approximate area covered by the aerial photograph on the opposite page lies in the southern half of the blocks. In diagram A, above, lava flowing down toward the Virgin River lowlands several tens of thousands of years ago has obliterated the north fork of ancestral Grapevine Pass Wash and is proceeding to divert the east fork of Grapevine Pass Wash (G) and Cottonwood Wash (C) into flow-marginal positions. Erosionally stripped sandstone arch of Virgin anticline stands as a ridge in southeastern portion of block; tributary of Virgin River has not yet begun to undermine arch by erosion of the underlying shale.



At present time, the erosional lowering of unprotected divides by Grapevine Pass Wash (G) and Cottonwood Wash (C) and their tributaries has emphasized sandstone cliffs across northern portion of the block and has left Washington Black Ridge (W) capped by remnant of lava stream, forming a valley "downside up" or "mountain upside down." Slope wash erosion by tributaries of Virgin River has undermined and destroyed crest of Virgin anticline and left Harrisburg Ridge (H) and Warner Ridge facing each other across Purgatory Flat (P).

sion by winds, streams, and glaciers, the hard rock remnants of less vulnerable synclinal structures may be left as high mountains, while the anticlines may be breached to form valleys. Many of the highest peaks and ridges of the Andes and other major mountain ranges show this type of inversion of relief.

The enormous volumes of eroded rock and the vast span of time required for geologic inversion of relief may be difficult to comprehend, in terms of ordinary human experience, but most of us have actually witnessed one or more types of relief inversion somewhat analogous to the geologic events described above. Where footprints have been left in freshly fallen snow, the compacted snow or ice formed underfoot is usually less susceptible to melting or to wind erosion than is the powdery snow surrounding the footprints. As a result, the footprints—originally "valleys" or depressions in the blanket of snow—later stand (Continued on page 220)



Khat, sometimes known as "the poor man's happiness," is pictured here growing in a khat field in Ethiopia.



The young, tender growing branches and leaves of *Catha edulis* are purplish-red, and command a premium price.

## Khat—Blessing and Curse

"REGARDEZ, madame, this we call 'the flower of paradise.' Chew it! It will make you happy and a little bit drunk." My French-speaking Ethiopian driver thereupon presented me with a sprig of leaves that he had plucked from a roadside bush.

I "regarded" the offering dubiously. The ordinary-looking green leaves appeared harmless enough, but I was acutely aware that one man's meat well may be another's poison. And I had no desire to be even a little bit drunk on a rather lonely Ethiopian road. Well, I had eaten sassafras and coca and raw tea leaves in my time; a leaf or two of the flower of paradise could hardly do much damage. Obediently, I began to chew.

The taste was slightly bitter, with overtones of licorice or possibly fresh filberts, but any untoward effect, either then or later, was non-existent. I am a nuisance to my doctor for the same non-reacting reason. What I did develop, however, was a consuming interest in this undistinguished plant that packs a punch—for more receptive individuals—quite unrelated to its appearance. Nor did the interest diminish on the discovery that the Commission on Narcotic Drugs of the United Nations is seriously investigating the medical and social problem brought about by the chewing of khat, which is the common Arabic name for the plant *Catha edulis*, and is said to be derived from a word meaning "sustenance," or "reviving principle." This plant seemed worthy of study.

To the addict—and his name is legion in Ethiopia, East and South Africa, and the Arabian peninsula—the scientific data on khat mean precisely nothing. His sole concern is a ready, daily supply of his beloved weed. Although the botanists did not catch up with khat until almost the end of the eighteenth century, there is good evidence that its cultivation antedates that of coffee and may be older, even, than that of tea. The Yemen Arabs insist that "it has been always, a gift from Allah to make us forget labor and pain." In any case, it was the Danish physician and botanist, Peter Forsskal, who, in 1775, collected some specimens of the plant and called it *Catha edulis*. Later travelers in the regions of its growth and use cast an inquiring eye on this so-called "poor man's happiness," and before long scientists were taking it apart to see what made it "tick." The results of their investigations were by no means unanimous. Khat turned out to be an elusive subject—for a number of unanticipated reasons. The leaves, either fresh or dried, were not easy to come by; early chemical analysis indicated differences in fresh and dried specimens (not actually disproved until 1952); the narcotic alkaloids were difficult to separate and assess; and the chemistry of khat had a disconcerting tendency to vary widely in plants grown under differing conditions of soil and climate. Even today, after more exhaustive experiments, there is still reasonable doubt about its exact chemical

properties, and more research seems to be indicated.

There is nothing spectacular in the physical make-up of *Catha edulis*. The botanist describes it prosaically enough as a shrubby tree of the family Celastraceae, with thin leaves that become leathery when old. It varies in height from three to six feet in dry soils in elevated situations, shoots up to twenty feet in the moist regions of Ethiopia's mountains, and turns up among the eighty-footers under equatorial conditions. A thin, smooth, brown bark covers pale yellow to dark brown wood that is moderately hard, lustrous, straight-grained, fine and even in texture. Cabinet-makers like it and so do the makers of high-class blotting paper. Sizable branches turn up as wattle in native wattle-and-daub huts.

Khat's flowers are small in size, white or greenish in color; its fruit is a dark-brown, linear capsule and its small, red to red-brown seeds are competently airborne in season by means of a single brown wing.

But the khat-chewer is not interested in anything but khat leaves. And not in the fact that these are bifarious, elliptical, lanceolate, coriaceous, and sharp. All that concerns him is that the leaves be in good supply and readily available, that they reach him as nearly fresh from the tree as possible, and that their price be within the limits of his often very slim purse. The botanical facts are worth nothing to khat-chewers.

How the tree grows may be a closed book to the consumer of its leaves, but it is naturally of moment to the planter. There is ample evidence that khat grows wild in Ethiopia and East and South Africa when climatic conditions meet its rather exacting requirements, but the wild supply is far below the steadily increasing demand. For a profitable harvest of khat leaves, it is up to the planter to supply relatively humid mountain regions ranging from 5000 to 8500 feet in altitude, away from salt air and sandy soil. As khat is fastidious about its home, and varies in quality almost from hillside to hillside, place of origin is a factor in the taste and effect of its leaves. Addicts claim to recognize khat "vintages!"

Wild growth is inclined to be sporadic, but commercial growers have developed a planting system calculated to produce maximum crops. In 1889 Deflers, traveling in Yemen, reported on the cultivation of khat; today the process is essentially the same. According to Deflers, the trees were permitted to grow unmolested for three years, but the plantation ground was kept clear and it was burned off and irrigated if necessary. At the end of three years all the leaves, with the exception of a few choice shoots, were removed. These shoots, developing young growth the following year, produced an inferior quality of khat, sold as *Cat Moubar-*

*rab*. The second year's crop of young shoots, *Cat Methani*, was considered the best, but healthy trees continued to bear for twenty or twenty-five years. Khat is singularly free of disease, and will bear two crops a year in congenial areas.

In 1855 the English explorer Burton, first white man to visit Harar in Ethiopia, commented: "The soil is rich and red; masses of plantains, limes and pomegranates denote the gardens . . . and between them are plantations of coffee, bastard saffron, and the graceful Kat." Harar is still an important area of khat cultivation, and today the trees, often interspersed with coffee, are kept pruned to about sixteen feet, and are grown and tended with the same primitive tools that have been used for centuries.

While the successful cultivation of khat presents relatively minor problems, its distribution—prior to the airplane age—has been a major headache. Over the centuries the trade has tried valiantly to cope with the difficulties of transporting tons of leaves long distances over bad terrain and poor roads and, in addition, across the Red Sea from Ethiopia to the Arabian peninsula. Where speed was essential in getting the fresh leaves from tree to market, the available transport was principally the slow-moving camel and the dhow! In 1889, Deflers reported that caravan loads of khat arrived daily at the coast of Yemen and Hadramat from the interior, and that Aden alone was receiving more than a thousand camel loads of the leaves annually. Forty branches of khat were "strongly compacted and enveloped in a sheath of palm leaves to prevent drying." Only this careful wrapping, the climate of the region being what it is, stood between the leaves and rapid and complete desiccation.

Today, the railroad and, more spectacularly, the airplane have largely taken over the job of whisking fresh khat from tree to consumer, although the camel must still do his sure-footed, lumbering best where neither railroad nor airfield exist. A chance remark by a member of the Department of Mapping and Survey in Addis Ababa to the effect that

By  
ELSIE A. PARRY

Photographs by courtesy  
Ethiopian Ministry of  
Agriculture unless otherwise  
credited.



The khat tree has small white flowers in cymes one-half to three inches long.



The tender leaves and stems at the tips of branches are sold to khat-chewers.



This sketch, from Engler and Drude's *Die Vegetation der Erde*, shows (A) a branch with flowers and fruit; (B) cross-section of a burst-open fruit; (C) an opened fruit with the front wing removed; (D) a cut-through section of the upper portion of an unopened fruit, and (E) the seed.

Ethiopian Airways has recently added extra daily cargo flights to meet the demand for khat was startling. According to a 1957 report by the U. N. Commission on Narcotic Drugs, Djibouti alone, with a population of 18,000, consumes on an average 80,500 bunches of khat a month—a staggering total of more than twenty-five tons! The report continues: "If the airplane from Ethiopia is late some day, you can be sure there are one, two or perhaps three thousand inhabitants of Djibouti who will be looking at the sky. Some of them do not return home for dinner. Sadly, they are waiting for their khat."

What does this "poor man's happiness," this "strength of the weak," this "inspiration of the mean-spirited," have that tempts a khat-chewer to part, all too often, with a quarter or more of his meager income to buy the leaves, to jeopardize his health, and to play ducks and drakes with his family's welfare?

The chemist, exploring the mystery in the laboratory, comes up with the information that *Catha edulis* contains three alkaloids; cathine, cathidine, and cainine, as well as ascorbic acid, sugar, tannin, rubber, and a few other chemical oddments. These ingredients, working together but in proportions not as yet clearly determined, produce a stimulant-narcotic effect on the central nervous system similar to that of cocaine, but they seem to have no analgesic or anaesthetic properties. They also produce cardio-toxic effects related to those of caffeine, but notoriously few khat-chewers suffer from heart ailments.

Again, the scientific jargon means nothing to the addict. All he knows, or cares, is that khat produces in him "a light and happy drunkenness," that it offers surcease from the hard conditions of his life—including hunger—and that with it he can "perform prodigies of strength and energy." No Yemen Arab, for instance, passes a day if he can help it without the aid of at least a few leaves of the precious khat. Its stimulating effect on brain and nerve cells is immediate, and if used in moderation, not apparently harmful.

But khat, unfortunately, does not lend itself easily to moderation. Too often what starts out as a pleasurable and relatively innocuous social activity—"taking khat" in company, like having a cocktail with friends—turns into a violent craving for the effects of khat-chewing; loss of sensations of fatigue and hunger, and a feeling of strength and tremendous well-being. Even the sure knowledge that this tonic exaltation will be followed, inevitably, by a depressive phase of almost semi-coma is no deterrent. Curiously, students of the problem agree that the desire for khat is not actually a compulsion, that there is small tendency to increase the dosage, and that there is no "abstinence syndrome." The danger lies in the secondary physiological and psychological effects that produce the social consequences that the U. N. committee has recently been viewing with alarm. When khat-chewing causes a man to eat and sleep less and less, to bring his bodily resistance down to a point where he "catches everything," to lose control of will and intellect, his family also falls victim to his inordinate craving. With the wage-earner's money squandered recklessly and daily on a few green leaves, near-starvation and the almost certain onset of the deficiency diseases spell the future for his wife and children. Male users eventually become sexually impotent, a factor that affects family life adversely and leads to frequent divorce.

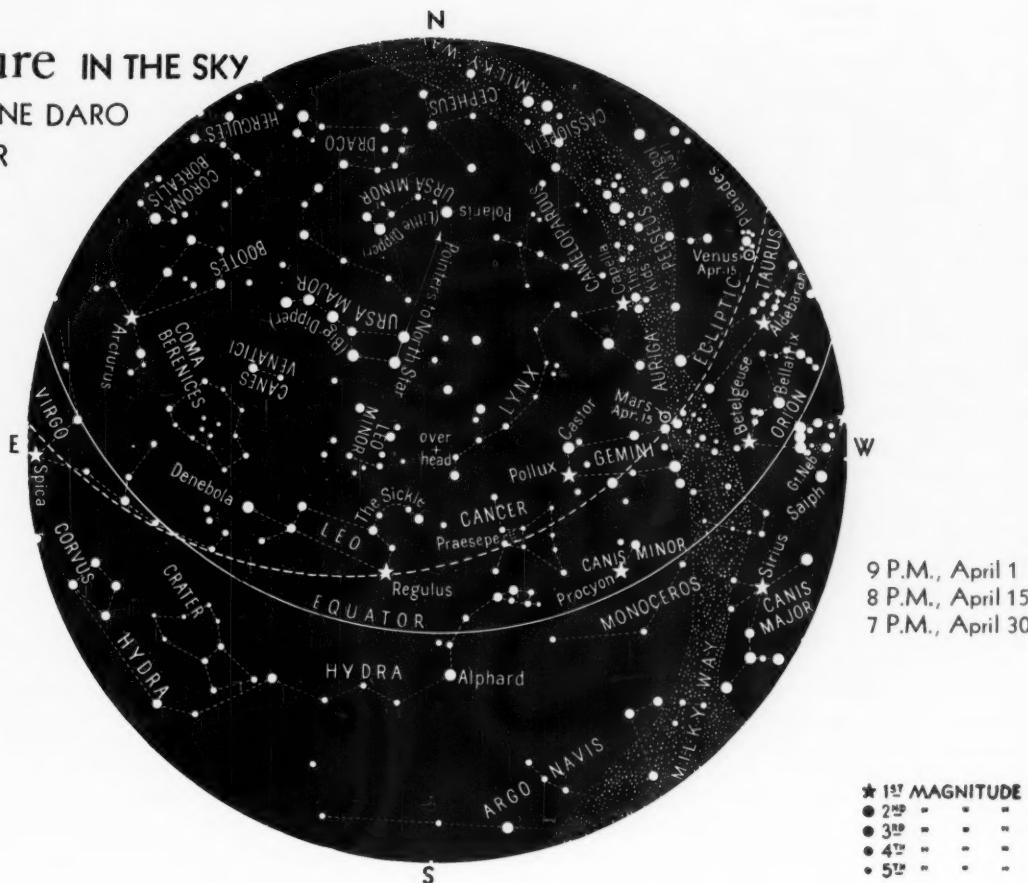
Khat-chewing is not a new problem in the areas where the habit is prevalent. Time was when it was prohibited among Arabs by the Koran, but a subsequent decree, taking into account its enormous popularity, freed it for use on the ground that it "only produced hilarity and good humour." Now its emergence as a spreading social evil is tied up with the extension of air transport. While the addict will "make do" with chewing dried leaves and drinking the tea-like infusion made from them, fresh leaves are what he craves. And it is the airplane that carries them to him still moist from the trees—tons of twigs daily for his delectation and his ruin.

Khat also figures importantly as a sort of primitive panacea. It is thought to be an antidote to plague—"a person wearing a twig in his

(Continued on page 219)

## Nature IN THE SKY

By SIMONE DARO  
GOSSNER



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

# The Atmosphere of the Earth

**W**E ARE SO used to being surrounded by air, and so accustomed to the beneficent effects of an atmosphere, that we often forget to "count our blessings" in that respect.

A few large meteors have in the past reached the earth's surface. The meteor crater in Arizona is one example of the damage they can cause. Fortunately, such occurrences have been extremely rare. But countless meteors of smaller size penetrate the earth's atmosphere every day. The friction of the air causes them to burn up before they can reach the surface. Thus we are spared a daily bombardment of gigantic proportions.

Artificial ultra-violet light is used currently as a germ-killer. Used in large doses, however, it would kill not only germs, but other living cells as well. As a matter

of fact, if the earth were exposed, unshielded, to the ultra-violet rays that the sun emits continuously, all life would be eradicated. The saving factor is, once again, the atmosphere, which absorbs these lethal rays.

Not to be overlooked is the fact that the atmosphere guards us from being roasted alive in the daytime and frozen to death at night. Consider that on the moon, for example, measures indicate that in the middle of the day the temperature exceeds that of boiling water, while at night it may drop to 240°F. below zero. The moon, of course, has no atmosphere. But, on earth, the thick layer of air forms a protective blanket. The heat rays penetrate only in moderate amounts. Thus we are guarded against receiving too much heat from the sun, and, at the same time, whatever heat has reached the

earth's surface is prevented from escaping too rapidly. The whole phenomenon may be compared to what takes place inside a greenhouse.

Not counting smog, exhaust fumes, pollen, and other localized additions to the air we breathe, it is found that the atmosphere is made up almost entirely of nitrogen (78%) and oxygen (21%). The remaining one percent is mostly argon (a rare gas), with a liberal sprinkling of carbon dioxide, small pinches of neon, helium, hydrogen and krypton (another rare gas), and even a trace of the hydro-carbon methane (the poisonous marsh gas).

At certain heights, the oxygen is found mostly in the form of ozone. Water droplets and ice crystals are suspended in the gas mixture.

In recent years, the use of high altitude rockets has yielded detailed information on the manner in which the temperature varies according to height in the atmosphere. Starting at sea level, the temperature decreases steadily to a minimum of 85°F. below zero at an altitude of about ten miles. The temperature then rises gradually to about 30°F. (just below freezing) at a height of thirty miles. Another gradual drop follows, to a minimum of 90°F. below zero at the approximate height of fifty miles. Beyond this point, the temperature rises rapidly and continuously until it reaches a steady level of 1500°F. to 2000°F. This level is reached at a height of approximately three hundred miles. Beyond this point, the temperature remains fairly constant to the outer limits of the atmosphere.

The terminology by which the broad divisions of the atmosphere are conventionally designated is based mainly on those variations of the temperature. Authors do not always agree on the exact definition of each word. Meteorologists, for example, are apt to use the terms in a slightly different sense than the upper-atmosphere specialists. These terms will be defined here in accordance with the recommendations made in 1951 by the International Union of Geodesy and Geophysics.

The troposphere is the lowest atmospheric layer, extending from sea-level to the first minimum of temperature mentioned above. The level at which the temperature first stops decreasing, or upper boundary of the troposphere, is commonly called the tropopause. Although the average height of the tropopause is approximately ten miles, it should be noted that it varies with the latitude, being highest at the equator and lowest at the poles. Its height may also depend on local atmospheric conditions.

The stratosphere constitutes the next layer. It extends to a point about twenty-five miles above sea-level, where the rise in temperature becomes more rapid. Its upper boundary is called the stratopause. The height of the stratopause varies also according to latitude and local conditions. Contrary to the tropopause, it is

at its lowest at the equator, at its highest at the poles.

The mesosphere extends upwards from the stratopause to the point, approximately fifty miles above sea-level, where the principal minimum of temperature is found. This upper level is called the mesopause, in keeping with the terminology outlined so far. It also is assumed that the height of the mesopause is variable. Many textbooks do not distinguish between the stratosphere and the mesosphere, and treat both layers as one under the name of stratosphere.

Above the mesosphere lies the thermosphere, where the temperature increases steadily with height. Its upper limit, the thermopause, is set at the point, about 300 miles up, where the temperature ceases to increase, and becomes stabilized within the 1500°F.-2000°F. range.

The name exosphere is used to designate the outer regions of the atmosphere, beyond the thermopause.

The term ionosphere is often encountered in texts dealing with upper atmosphere research. It does not belong to the temperature classification reviewed above. The ionosphere is a vast region of the atmosphere where ionization is present, that is, where atoms have been stripped of some of their electrons under the influence of solar radiation. The lower boundary of the ionosphere is found at about forty miles above sea-level. It is known to extend to the outer confines of the atmosphere. Ionospheric phenomena are among the most important ones with regard to the influence of the atmosphere on the earth. Some of them, such as the aurora borealis, are also among the most spectacular. They will be the subject of the next article in this series.

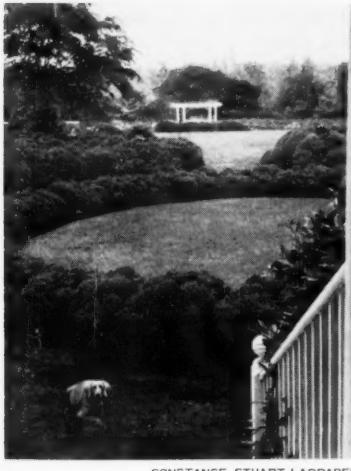
In the month of April, the New Moon will occur on April 7 and the moon will be full on April 23.

Mercury will be a morning star, rising in the east 15 minutes before the sun on April 1, and one hour before the sun on April 15 and April 30. It will reach its greatest western elongation on April 26, but even on that date it will be poorly placed for observation, because it will be low in the sky throughout that month.

Venus will be an evening star. It will set about three hours after sunset during the month of April. It will be seen as a brilliant object (magnitude -3.5), high in the western sky in early evening.

Mars will set at 12:30 a.m. on April 1, 12:15 a.m. on April 15, and about at midnight on April 30. On April 1, it will be nearly overhead at dark. Its magnitude will be +1.4.

Jupiter, in Libra, will rise at 10:30 p.m. on April 1, 9:30 p.m. on April 15, and 8:30 p.m. on April 30. It will be found to the northwest of Antares, rising in the east-southeast. By dawn, it will appear low in the southwestern sky. Its magnitude will (Continued on page 220)



CONSTANCE STUART LARRABEE

On the itinerary of the Maryland House and Garden Pilgrimage is "Mt. Air," in Charles County, Maryland, an attractive white manor house built in 1740 and site of a notable boxwood garden. The dates for the Pilgrimage are April 25 through May 10.

### Maryland Homes and Gardens

April 25 through May 10 are the dates for the Maryland House and Garden Pilgrimage. Among the fascinating places to be visited are the magnificent topiary gardens of Harvey Ladew near Baltimore, the Sherwood Gardens in Baltimore, the gardens at Drayton Manor in Kent County, as well as many fine boxwood gardens, such as the one at "Fairview" in Talbot County, where there are also many beautiful old trees, particularly yews and magnolias. The Pilgrimage is jointly sponsored by the Federated Garden Clubs of Maryland, the Society for the Preservation of Maryland Antiquities, the Maryland Historical Society and the Baltimore Museum of Art. Full details and a copy of the tour book, containing maps and description, may be had on request to Pilgrimage Headquarters, Room 223 Sheraton-Belvedere Hotel, Baltimore 2, Maryland.

### Whooping Crane Count

The annual January aerial survey of Aransas National Wildlife Refuge by the U. S. Fish and Wildlife Service reveals that 32 whooping cranes were present there, the same number as noted in late November. Three fully-grown whoopers that went to the nesting grounds last spring failed to return to their wintering grounds, and the wintering-ground population now is 23 adults and 9 young.

### A New State Park

On December 29, 1958, the State of Maine acquired title to 570 acres of land just south of Lily Bay, on Moosehead Lake, for inclusion in its State park system. A gift of the Scott Paper Company, the new area is the first of what the Maine Park Commission hopes will be two park areas on Moosehead Lake, and it is likely that initial development of this land gift will include an access road, provision for about 150 campsites, a parking area, and other necessary facilities.

### Visitation Figures

A new high in national park visitation is reported by the National Park Service in a recent release of figures for the year 1958. Total national park visitation for the past year was 21,672,000, a 3.7 percent increase over 1957, while the 83 national monuments reported a total of 9,734,000 visitors, up 4.1 percent from the previous year. Lower visitor totals were reported for the 59 national historical areas.

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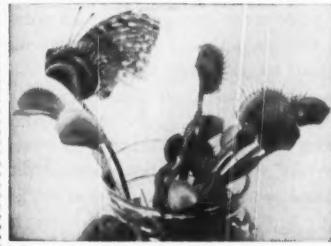
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# Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University,  
and Director of Nature Education, The American Nature Association

## Some Say "Yes, but . . ."

AS USUAL, THE ANNUAL MEETINGS of the American Association for the Advancement of Science proved stimulating. Some sessions were stimulating because of their promise for the future. Others made us wonder just how long we were going to stay in some of the same old ruts. Everyone seemed to recognize that we are facing a new world in these next few months, but too many seem determined not to do anything to upset the old applecarts that have stood around so long. We agree that something must be done, but we hesitate to do anything about it, for many reasons.

I enjoyed the meetings particularly because of the opportunity they provided to renew old acquaintances, to hear new ideas, to have my horizons for the future widened. Roughly, a third of my time was devoted to satisfying routine professional duties, a third to discussions in the lobbies of all sorts of situations, and a third to exposing myself to really challenging situations. Which of these was most important I do not know. For the most part, I spent my time seeing the American Nature Study Society start off on the second half-century of its existence and the National Association of Biology Teachers start its third decade. Other time was profitably spent visiting exhibits, attending annual dinners, and listening to general lectures by leaders in their respective fields.

### Competing with Russia

One of the outstanding talks to which I listened was given by Oscar Riddle on the competition with Russia in science education. I had the good fortune to spend more than an hour with him, after his talk, discussing some of the issues he had raised. This discussion, enriched by others with leaders from coast to

coast, seemed to point to a few conclusions.

It seems obvious that science has brought us to a number of strategic thresholds. We expect that power may be available in the future in forms and amounts that we could not have believed possible a few years ago. It seems probable that we will face a whole new civilization when such power becomes available in parts of the earth where it was not previously accessible. This points to a bright but a dangerous future. With justice, we have worried about an inadequate and uncontrolled supply of fresh water. With the new power available for our use, this problem may well be solved, and with it will vanish much of our concern about an inadequate food supply. Unequal availability of this food and water over the earth may magnify social conditions that at present are disturbing.

Barriers to the wide distribution of the blessings of our discoveries in science will be pierced by our new abilities to master space, but even this will cause disturbances because, while we may be able to meet new people and recognize new problems, we often may not have the skill to understand these groups because of language and cultural differences that cannot be reconciled quickly. All of these things call for a caliber of leadership and understanding that in the past was hardly necessary. Now they must be met, whether we like it or not. No longer can we shrug off our responsibilities and complacently show no concern about the problems of our neighbors. We simply cannot continue to give certificates of accomplishment to those who have not demonstrated implied mastery. Even politicians may have to understand economics, mathematics, history and language. Ethics must be reborn.

Everyone seemed to agree that a competitive civilization is growing

up to the east of us, and a competitive human population still farther east. These have reached competitive stature largely through improved methods of education that have rewarded those who have demonstrated their capacity to grow and to assume responsibility. We have not done this, partly because of our philosophy of neglecting the gifted person to help those not so able. In part, this has been due to our unwillingness to face facts, with the result that places of strategic leadership often have been occupied by incompetents. Only the greatest courage and tact can correct the situation.

### In trying times

Time and again the idea cropped up that we were in trying times, but . . . We admit that this and that are wrong *but* we hesitate to do anything about them because of what others may think. It would seem that a time of reckoning is almost upon us, and that the opportunity for merit to get recognition will be greatly magnified.

I stopped in casually at a few meetings where there seemed to be little concern about current dynamics. This was refreshing, I admit, where situations considered were largely academic and where responsibilities were not great. It was disturbing, however, to find some leaders in science education continuing to "laugh off" criticisms of their work—criticisms that were even more valid today than when they were first made more than thirty years ago. My file in this field continues to grow, and I hope to make it generally available within a year.

Of course, there is a lighter side to these meetings. It is fun at least once a year to sit down and talk with folks you like, and whose problems are yours. Bill Vinal of New England, George Jeffers of Virginia, John Breukelman from Kansas, Stanley Mulaik from Utah, and Roland Ross and others from the West Coast—and their kind from nearer home—make a meeting that is successful to me just as others get their satisfaction from contact with other groups. I rarely come away from a visit with Roger Peterson without valuable experience. Twice, since I heard him talk about his experiences on South American mudflats while seeking flamingoes, I have had nightmares in which I got stuck in the mud just as did he. How he sur-

vived some of those experiences are as incomprehensible to me as why he should want to risk them in the first place may be to others. The ambition to be the first man to see and study in the field all known species of flamingoes led him to the production of a report that was wholly in keeping with a meeting of the American Association for the Advancement of Science. It had little to do with the rivalry between Russian and American science.

On my return home, I found a letter from a former student who had not been able to write freely of his experiences in Moscow and Delhi, where the governments seemed to feel he needed watching, and could not understand why he should be engaged in a simple project of studying and gathering "game" birds. He felt that he was constantly being watched to be sure that he was not a spy, and said that he had to "report every time he wanted to go into the open country for a field trip." Under these circumstances, it was a great temptation to simply buy birds in the open market and ship them back to America, without getting the basic data that was essential to the success of his study of the natural environment of the birds. Happily, he apparently did not yield to the temptation. He wrote that, in India, it would seem that "freedom is license to do what one wants without the realization of the necessity for responsibility . . ." and that since British leadership is now discredited, "wildlife management and conservation which they sponsored is now discredited," with the result that before the pendulum swings back several species of interesting and useful birds may be exterminated. This view was interesting in terms of my earlier School Page reports from London, Athens and the Far East. His report that freedom is interpreted as license contrasts with a definition I heard at the Washington meetings that freedom is merely an opportunity for self-discipline. That phrase stuck in my memory. I rather suspect that it is appropriate whether applied to international crises, educational problems, or personal affairs. Discipline, of course, means that you can not avoid responsibility for doing what seems to be right whenever the opportunity presents itself. You can not sit back and let Nature take its course. You can not get out of taking sides on important issues

simply by saying, "Yes, I agree with you, but . . ." Therein, to me, lay the most challenging idea I got from the Christmas meetings. Nothing is accomplished in the long run by saying "Yes, but . . ." ♫ ♫ ♫

#### Summer Opportunities

The approaching summer season will offer opportunities for hundreds of nature enthusiasts, science teachers, college girls and graduate students to enjoy a paid "vacation" in the capacity of nature consultants and camp counselors at Girl Scout camps throughout the country, notes Miss Fanchon Hamilton, recruitment and referral advisor of the Girl Scouts of America, 830 Third Avenue, New York City 22, New York. To qualify as a nature consultant, a woman must be at least 21 years of age, have the required specialized knowledge based either on formal training in the natural sciences, or informal personal interest in nature study. Women of 18 years of age may become camp counselors if they have had experience in camping and working with children as a leader, teacher, or program consultant. For jobs near home and for more information, interested women may query their nearest Girl Scout council; for openings in other parts of the country, they should get in touch with Miss Hamilton at the above-mentioned address.

#### Trifocal Trouble

Although he seeks no absolution for his crime, E. Laurence Palmer says that it must have been his trifocals that made him read the wrong line in a reference work and to assert in his feature, "Turtles" in the January, 1959, issue that: "More than 4000 species of living turtles are known to science . . ." That was the figure on the line referring to the world's reptiles. The known turtle species is believed to be not in excess of 250.

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# THE Nature CAMERA

By EDNA HOFFMAN EVANS

## Good Nature Photography

THIS SECTION IS THE RESULT OF another day spent watching the judging of a set of Nature slides. There were more than 400 of them, representing the efforts of about a hundred amateur photographers living in many parts of this country and Canada; and there was one lone camera fan from Europe.

More and more, as I watch these contests and observe what other photographers have done—and this time I had entered four slides of my own—I find my ideas about Nature photography changing, growing, and becoming more discriminating.

There is so much more to taking a good Nature picture than just aiming one's camera at an acceptable subject! There are techniques to be observed, distractions to be avoided, standards of quality to be attained—more, I am sure, than many picture-takers ever dreamed existed. We amateurs and hobbyists are setting increasingly high standards for ourselves. I am willing to wager that there are more good amateur Nature photographs taken each year than there are professional or commercial ones.

I sometimes wonder whether, by setting such high standards for ourselves and our fellow hobbyists, we are just putting up stumbling blocks, or really moving closer to perfection.

Let me inject at this point an explanation that the standards and contests I am writing about are those set up and sponsored by the Photographic Society of America. Membership in this organization is open to all interested camera enthusiasts, either as individuals or as members of affiliated camera clubs. The slide contest I watched being judged was one of four held annually for individuals by the PSA Nature Division.

Entrants in these are divided into Class B, Class A, and Class AA, depending on past proficiency and attainment in similar contests. Thus, a newcomer who has had few or no

slides accepted by the various salons and competitions is competing only with others in the same situation. The slides entered were restricted in that they could not have been accepted or given awards in any previous contest or exhibit. It was, in fact, a testing ground for new work.

### The qualifying factors

What do judges look for in present-day Nature photography competitions? Of course, there are the unchanging standards of focus, exposure, and lighting. Composition is important; so are qualities of human interest and other photographic techniques.

The judges also insist that a Nature picture be "natural." That is, the subject must appear in a suitable setting, one that is compatible with its native habitat. It should appear to be at liberty, at ease, and at home, even though the judges may suspect that it is not.

The possibilities for this sort of set-up photography are legion. There

was an owl picture among the slides, for example; the bird was posed with a freshly caught mouse in his talons. The owl had not caught the mouse, and he may not have felt like devouring it. But the picture looked as real as could be. One could imagine that the lucky cameraman had come upon the scene in the woods somewhere, or had waited patiently for hours to get it. The photographer *had* worked for that picture, to be sure; but not in the way an uninitiated observer might imagine.

If the owl did not catch the mouse he was posed with, then who did? The photographer, probably, or some "small fry" hired by him to set a mouse trap in a likely place—maybe the stock room of the corner supermarket, or in a vacant lot. The picture was a "set-up," and the subject was posed as carefully as any model could be.

### Several fox pictures

There were several fox pictures in the group also, with the fox posed quite naturally. These were "set-ups," too, and the fox had been brought in from the wilds and kept captive for a time. It had received good care, however. Otherwise its coat would not have been as sleek and unruffled as it appeared in the pictures.

Nor is this simulation of natural settings confined to bird or animal pictures. Many wildflower photographers, too, collect their specimens

This picture illustrates some of the "do nots" in Nature photography. The owl is obviously a captive; it is disturbed and angry; it is out of its natural habitat; its pose is unnatural, and its feathers show traces of handling. Otherwise it is not a bad picture.





This pose is much better, since it is more natural and in a better setting. However, the bird's ruffled feathers show that it has been inexpertly handled, and if you look closely you can see a string tied to the owl's right leg. The tail feathers are out of focus. This picture, too, can stand much improvement before it meets the exacting standards of PSA Nature photography. Does this sound too critical? It is meant to help keep the photographer "on his toes."

and take them home to better lighting and photographing conditions. Or, as another technique, they may carry "properties" with them to arrange in the natural habitat. I recently heard one flower specialist tell of "carrying rocks around," just to help with the proper settings.

It is a little disillusioning, but nonetheless true, that you cannot always tell an authentic sky background from a blue cardboard with some white chalk on it to give the out-of-focus impression of distant clouds.

Judges are aware of such techniques—they probably use them themselves. Thus, they are exacting in their demands on the other fellow. Not only must the pose and setting be natural, but the focus must be equally sharp on all parts of the subject. In a controlled set-up, not even the remotest tail feather can be fuzzy. Nor may the subject show any trace of human contact. Unnaturally-ruffled feathers or fur are a sure give-away, for they indicate handling; and that is poor technique, in the opinion of the judges.

So far as sharpness of focus is concerned, there seem to be two oppos-

ing philosophies. Some judges demand that every item in the picture, from the nearest grass blade to the farthest leaf, be sharply focused. Others take the attitude that the main subject must be sharply in focus, but the background is incidental. It need not be in focus, so long as it does not distract from the center of interest. It may "suggest" a setting, rather than picture it in detail. However, there should be no distracting light specks, no hint of halation, no "hot spots" or eye-catching blurred areas to draw attention away from the main point of interest.

#### Prefers real thing

I do not mean to give the impression that all present-day Nature pictures are set-ups, or studio-type shots. No true Nature photographer prefers them to the real thing. Indeed, for many of us, more than half the fun of Nature photography is in being outdoors and really getting close to Nature. We still stalk our quarry with telephoto lens and field glasses, and get as close to it in its native haunts as possible, whenever time, conditions, and location will permit.

As for these standards we have set for ourselves—they have a bad side as well as a good one. Sometimes we seem to think that criticism must really be critical and must "tear things to pieces." With this philosophy, no picture or slide can be allowed to pass without having some flaw found in it. This fault-finding attitude sometimes leads us to extremes. Take, for example, the criticism I heard recently of a nice timberline shot. There were too many clouds in the picture, said the critic. Pray tell, what could the photographer have done in that case—concocted some sort of a wind machine to blow the offending clouds away?

In taking, in judging, and in criticizing our Nature pictures, I believe we must remember that Nature is Nature—not always a perfect combination, more often flawed than flawless. I believe it is up to us, as Nature photographers, to record Nature, not to try to rearrange it to suit our own ideas of perfection, but to present it "as is" in the best possible light. We should do that with our own pictures, and we should appreciate the same sort of naturalness in the other fellow's pictures.

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# Nature IN ROCK AND MINERAL

By PAUL MASON TILDEN

## Calling in the Geologist

THERE WAS A TIME, PERHAPS, WHEN THE

practicing geologist was viewed by much of the public as a mere hunter of rocks and a delver into secrets that might better be left unprobed. In pursuit of his investigations—especially his field work—a geologist ran a certain risk of being classified as something of a "specimen," himself.

Today, all that is changed. Geologists are key men in many segments of the modern industrial world, and, like brother scientists in other fields, they have acquired the title of "specialists." Geologists who study and classify rocks according to chemical composition are petrographers. Those who speculate about the causes and record the effects of moving ice are glaciologists. Geologists who interpret the sequences of the layered rocks that cover a goodly part of the earth's land surface are stratigraphers; and there are many other such categories of earth-specialists.

During recent years there has been an interesting collaboration between geology and industry in an attempt to provide, of all things, more storage space. If this sounds like a job for warehouse operators rather than geologists, it should be said that this particular kind of storage space has been designed for natural gas, and that the idea has been to discover places where it may be stored under ground.

### Variations in demand

Because of the tremendous seasonal variations in the demand for the natural gas that is distributed to many parts of the country by pipeline, public utility companies have been anxious to secure storage facilities large enough to supply a steady volume of fuel to their customers even under the severest weather conditions. In big city areas, above-ground tanks suitable for the most economical storage and delivery of gas would need to be of fantastically large proportions, outrageous both economically and esthetically. The

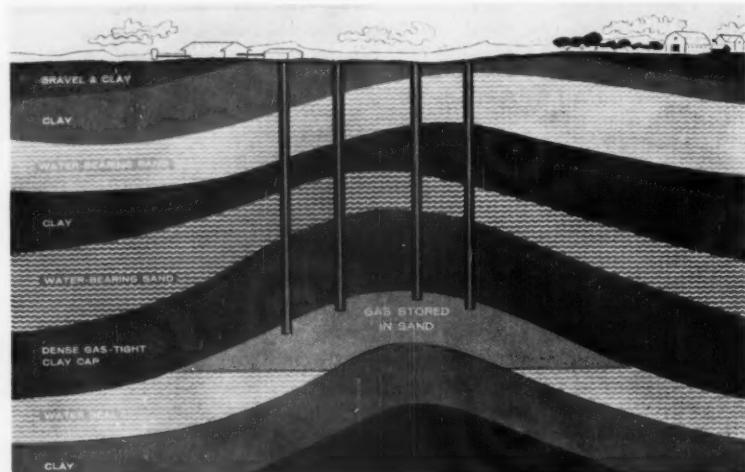
answer seemed to be, in many cases, under-ground storage facilities. Nature stored the gas under ground to begin with; why not carry it by pipeline and store it again under ground against the time of abnormal need? This is where the geologist entered the picture, to probe rock structures with delicate instruments and determine their suitability for use as under-ground gas storage tanks.

Companies whose domain was floored with granite or highly metamorphosed rocks had to be satis-

illustration typifies the "dome" type of trap, formed in this case of alternating layers of water-bearing sand and impervious clay, the whole having been somewhat arched up by gentle compressive forces. Water-bearing sandstone might be substituted for the layers of sand in the illustration, and shale for the capping layers of clay, but such a general sequence of pervious and impervious layers must be present to create a stratigraphic trap that may be used to man's advantage.

A glance at the illustration will show that geological formations which have been roughly handled by strains and stresses—that contain fissures or badly mashed strata, for example—would hardly qualify as gas reservoirs.

After being carried across country by pipeline, the natural gas is forced into the top of the dome under high pressure, displacing the water in the



The illustration below is an artist's simplification of the geological conditions necessary to create a "dome" type under-ground storage facility for natural gas. Under actual field conditions, there may be hundreds of distinct strata of rock or of alternating layers of sand and clay. The illustrated section represents a vertical distance of some 1500 feet.

fied with conventional above-ground tanks; but in areas of gently folded and well-stratified rock formations—or even formations of alternating beds of sand and clay—natural gas-trapping formations were present and are being used today for the storage of immense quantities of natural gas.

### Trapping the gas

To store gas under ground, some sort of "stratigraphic trap" is necessary; and, while there are a number of different kinds of such traps known to geologists, the accompanying

sand or sandstone, the water then standing around all sides of the trap and preventing the escape of gas along the pervious layers. The arch has now become a great under-ground storage tank, ready to deliver, at constant pressure, as little or as much fuel to the company's customers as weather conditions make necessary. The company has its natural tank, the customer has steadier and cheaper fuel, and the geologist—who may be one of the company's customers—may take pride in a job well done!

## Philadelphia Herps

Lest the impression be given by the article about the Philadelphia Herpetological Society in our January, 1959, issue that that group is concerned only with a reptilian auction, we must record that it is engaged in various good works herpetologically. The group publishes the *PHS Bulletin*, conducts an information service that functions as a center for exchange of herpetological information, and brings together like-minded folks at regular meetings. The auction, which, incidentally, is held at the Philadelphia Academy of Natural Science, is an annual affair. If you live in the Philadelphia area and are interested herpetologically, get in touch with Norma Rothman, 7102 Rising Sun Avenue, Philadelphia 11, Pa.

### Singing Tower Visitation

On February 1, 1929, the late President Calvin Coolidge attended the ceremony that marked the dedication of journalist Edward W. Bok's "Singing Tower" at Lake Wales, Florida. Thirty years later—in February, 1959—some thirteen million visitors had climbed 295-foot Iron Mountain, highest point of the Florida peninsula, to hear the music of the 71 bells of the singing tower and quietly to enjoy the animal and plant life on the trails of Mountain Lake Sanctuary. The Singing Tower charges no admission and offers no entertainment (other than the bells at certain times of year) and its annual maintenance is paid by the American Foundation, created by Edward Bok.

## Khat

(Continued from page 210)

bosom can go among those affected and plague does not appear where khat trees have been cultivated." An infusion of the leaves is used as a prophylactic against coughs, asthma, and other diseases of the chest, as well as stomach ailments. It even appears as a diuretic in treating gonorrhea. And not surprisingly, considering its exaltation-producing qualities, khat has religious significance. Tanret, writing in *La Presse Médicale* (1933), points out: "The whole country (Ethiopia) is persuaded that this shrub enjoys divine blessing; no private or public ceremony can take place without the ritual chewing of the leaf accom-

panied by much praying and singing. In the Moslems of Harar it induces a strong religious exaltation, which they regard as a gift from heaven."

Here, then, we have an African-Middle East form of escapism used—and abused—by people whose daily lives are difficult and largely devoid of pleasant distraction. In *The Land of Burnt Faces*, John Buchholzer writes: "In the shadow of the houses and in the cool darkness of the shops men sit chewing *khat*, a narcotic of great importance in Mohammedan communities. Brown fingers search for another delicate leaf in the bundle lying wrapped in banana leaf on the cracked earthen floor . . ."

Early in 1957, the French Government, alarmed by the results of an extensive survey conducted at Djibouti, decided to prohibit the use of khat as a social evil that produces, among the male part of the population, "a state actually bordering on mass neurosis." Other governments are being urged to take similar steps, as the British did in Somaliland and Kenya, to eliminate a widespread habit that has gotten dangerously out of hand.

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## Nightgown Fish

(Continued from page 188)

parrotfish "chewed a cud." This is not literally true, but the parrot is one of the fishes that really masticates its food.

Several of the eighty known species of parrotfishes have wide distribution; most of the others stay within limited areas. Although comparatively rare, as a whole, parrotfishes can become quite friendly and sociable. To residents of the Florida Keys who have docks on their properties they are real "homebodies" hovering about, although there is little that man can offer in the way of tidbits that appeal to them. Because their flesh is worthless as food, fisherman make no attempt to catch them and usually throw back any that are curious enough to snap at a hook.

As might be expected of animals that give their teeth and beaks such rugged usage, parrotfish need dental attention. They get it in the wrasse, a small cousin of parrotfishes. One of the extraordinary sights along the reefs is that of a large parrotfish, after browsing on living coral, upending itself and remaining motionless in midwater while a school of wrasse move in to clean its beak and scales thoroughly of all adhering debris!



## Catesby

(Continued from page 205)

low country within sixty miles of the coast, collecting, describing, and painting animals and plants. He then went to the upper, uninhabited region and continued at or about Fort Moore, midway between the source and the mouth of the Savannah River. There he wrote: "I employed an Indian to carry my Box, in which besides paper and Materials for Painting, I put dry'd Specimens of Plants, Seeds, & as I gather'd them. To the Hospitality and Assistance of these friendly Indians, I am much indebted, for I not only subsisted on what they shot, but their first Care was to erect a bark hut, at the approach of rain, to keep me and my Cargo from the wet."

Catesby remained almost three years in Carolina and "the adjacent parts (which the Spaniards call Florida, particularly in that province

called Georgia)," then went to Providence and explored several of the Bahama Islands. His text shows that he also visited the Bermudas, and Mrs. Allen records that he had made a trip to Jamaica in 1715. All of these localities as well as the coastal region of what is now the southeastern United States were shown on a double-page map accompanying his book.

He returned to England in 1726 and busied himself with the preparation of his great work, for which he personally etched the plates. As the parts appeared, they attracted favorable attention and led to his election to the Royal Society, the leading scientific organization of the British Empire, in 1733. He took an active part in the Society for the remainder of his life; a paper by him entitled *Of Birds of Passage* was read in 1746, and published the next year. His *Carolina* was a success, yielding an income that supported him and his family.

There are two quite divergent accounts of Mark Catesby's death, the more credible one of which, unearthed by Dr. Allen, is that he died at sea April 20, 1750, on a voyage to the East Indies.



## Mountains

(Continued from page 207)

in relief like a boobook's footrests. Similarly, the compacted soil in wagon tracks has sometimes been left standing in relief because of wind erosion of the surrounding powdery dust. Except for a factor of about one million, in the scales of size and time, these familiar examples may help in an understanding of the formation of "mountains upside down."



## Atmosphere

(Continued from page 212)

be - 2.0.

Saturn, in Sagittarius (magnitude +0.6) will rise at 1:00 a.m. on April 1, midnight on April 15, and 11:00 p.m. on April 30. It still will be visible low over the southern horizon by dawn.

The annular eclipse of the sun of April 8 will not be visible in this country. It will take place over the Indian Ocean, Australia, and the Pacific Ocean.

Observations of the Lyrid meteor shower on April 20-22 will be hampered by the full moon.



## April Poem

(Continued from page 186)

is a W-Hollow green.

Over the years we have kept fire out of these woods and the valley is now paying dividends. The people who fly over it look down on the timbered hills. It is a green carpet beneath the bright skies. And those who walk over the crust of this earth look up through green clouds of rustling leaves to the bright air and the sun above. It is a beautiful place to look down on from above, as I have many times. It is good to look up from below into the bright skies, as I have done all my life.

So this is W-Hollow, a land of beauty in the April spring. This is W-Hollow, the land of wild flowers of many varieties on bluff, in valley and on the hilltops. This is W-Hollow, my land, our land, visitors' land, a clean place to live with good, clean unpolluted wind to breathe. This is the land of the wild birds. This is the land of fox, 'possum, 'coon, rabbit, and squirrel. This is a land for the wildlife. This is the land that only death will make a person leave.

W-Hollow is an April poem that is written each year on the wind. One has to be here to read it. One has to be here to live it. One has to be here to feel, to know and to love it. And when one is here, and when he reads the April poem written on the wind of W-Hollow each April, he is happy. And he waits patiently for another April and another poem. It is the power this land in April holds over all of us. For it is the most beautiful valley in the world. Today I shall continue reading what is written on the wind, for in a few days it will all be gone. Another W-Hollow April will be finished. We shall wait again patiently for next year.

## Bulletin

"Forestry and Deer in the Pine Region of New Jersey" is Station paper 109 of the Northeastern Forest Experiment Station at Upper Darby, Pennsylvania. This 33-page pamphlet is by S. Little, G. R. Moorhead and H. A. Somes, who present a summary of our present knowledge of the relationships between forestry and deer, and of the pressing need to attain a balance. It may be requested from the U. S. Forest Experiment Station at Upper Darby.

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# Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

## Science Shops

### 14. Will Corporation

THE CONSUMER of science goods, like many in other professions, might well ask, "Why buy from a jobber when you can go direct to the maker? Should we not eliminate the middleman and thus save a great deal of money in salaries, buildings, handling, and transportation?" The answer is easily found in a statement of the business activities of Will Corporation, whose customers are high school and college teachers, purchasing officers and department heads of educational, hospital, research, and industrial institutions all over America and in numerous foreign lands.

Will's new Catalog No. 7, issued in 1957, covering 1000 pages, with several thousand illustrations, lists 20,000 items, representing the products of more than 900 manufacturers. Instead of the customer having to maintain a bookcase full of separate catalogs, leaflets and broadsides, and sending out dozens of separate orders, he can obtain all of his supplies with a single order to one firm, and not only with no extra cost, but also with a saving in expenses connected with mailing, transportation, and delivery. The jobber sells at the manufacturer's list price, with discounts to certain types of buyers, or for quantity purchases; he, in turn, is given a discount by the manufacturer for taking on the task of storing large numbers of items and distributing them. Thus he makes his profit from the manufacturer, not the consumer.

The history of Will Corporation (they do not use the definite article before the firm name) begins some 37 years before the founding of the company—which is at least an unusual situation in corporation biographies. Back around 1880, the Bausch & Lomb Optical Company in Rochester, N. Y., was not only selling scientific instruments, but found that it also had to provide microscope slides for users of their microscopes, and laboratory equip-

ment, glassware, and reagents, since these were not generally available elsewhere. With a few exceptions, such items had previously been obtainable only by importation from European sources.

#### Sources cut off

With the advent of World War I these sources were cut off, and there was great need for augmented American production. Concurrently, the facilities of Bausch & Lomb were taxed to the limit to furnish optical equipment for the war. So, in 1918, the company sold its great stock of prepared microscope slides to Ward's Natural Science Establishment, and its glassware, apparatus, and chemical stocks to Will Corporation, restricting its own activities thereafter to the manufacture of optical glass, instruments, and such adjuncts as microtomes.

A year earlier, Roland T. Will had organized the firm that bears his name. He was a research and analytical chemist and, when the war cut off materials from Germany, developed a number of biological stains, some of which are still in use. His function at this time was mainly to supply chemical services for industrial organizations that did not have their own laboratories.

Launching out into the business of general laboratory supplies, Will Corporation began a steady growth that today has reached huge proportions. After the death of Will, the management fell to William Dalton, who became widely known personally to a host of teachers of the natural and physical sciences in the colleges and universities of America in the 1920's and 30's. He made it a point to visit as many of his customers as possible, and his recent death was felt as a distinct loss by many who still recall his smiling and magnetic personality. Running the large organization now devolves upon Harold J. Coleman, one of the first employees engaged by Will in the early days of the firm.

Today, the company has grown from an original small rented space in Rochester to nine divisions. Six

of these are distribution centers for laboratory supplies, located in Rochester, Buffalo, New York City, Baltimore, Atlanta, and South Charleston, W. Va. One subsidiary, Bronwill Scientific, Inc., of Rochester, imports foreign-made instruments and technical items, and distributes to other dealers; another, the Will Process Equipment Corporation, also of Rochester, and a third, the Will Process of Atlanta, are distributors of materials for the handling of fluids, as Pyrex Brand Double Tough Glass Pipe, Teflon gaskets, ceramic valves and pumps, filtration equipment, and other related products. This is a rapidly expanding division of the business.

#### Units interconnected

Each of these nine units maintains its own complete stocks, offices, warehouses, and experienced personnel. All of them are interconnected by teletypewriter. If one branch should be temporarily out of one or more items, an inquiry to the other warehouses locates the desired article within a few minutes, and direct shipment is on its way the same day. Another advanced feature is a perpetual inventory system, an elaborate method of advising the purchasing department of needs, so that stocks are at all times kept up to normal volume.

But this does not tell the whole story of Will Corporation. They maintain a large glass-working shop in the home plant at Rochester, where some fifteen experts under Hans Blaessig are kept busy making special items of glass equipment to specification. If you have a research problem and find no standard item that quite fits the need, Will can make it for you. Another special service is their Instrument Repair Department, where craftsmen repair everything from microscopes to electronic equipment. The story is told that five electronic instruments were damaged by fire at a large technical college, and that Will repaired and returned them within 48 hours, so that class schedules continued without interruption. As might be imagined, such service makes friends.

On another occasion a large industrial organization needed twenty-one instruments reconditioned during week-ends so that no working time would be lost. They were brought to the Will shop seven at a time on Saturday mornings, overhauled, and returned to the laboratory on

Monday mornings. This is certainly service extraordinary.

Will Corporation also has a testing laboratory, where it tries out an average of about 1000 new products each year. About twenty percent are accepted, and find their way into the next Will catalog. Since the company does not engage in extensive manufacturing, but functions as a sales agent for all kinds of laboratory equipment and supplies, it is not interested in selling the customer some particular brand, but rather in making certain that the items ordered will exactly fit the requirements, and thus they are in a position to act in an advisory capacity. If the customer puts his problems up to Will, he can be rendered a prompt and impartial service of advice and recommendation. Another feature is a demonstration laboratory, where the customer may see devices at work and have their operation explained before he invests.

#### Trained personnel

Last, but by no means least, the shipping departments in the several branch houses must be manned by a highly trained personnel, in order to pack for safe transmittal such diverse items as fragile, complex glassware, heavy but perhaps delicate instruments, or large containers of chemicals. No mere bundler of Christmas parcels can qualify here without considerable training. The day-to-day experiences in a big science shop like Will Corporation would fill a large volume of fascinating tales.

In addition to its general catalog, there is a separate one for chemicals, and a 16-page *LabLog*, issued several times a year to announce new instruments. There are also frequent leaflets and bulletins covering equipment in specialized fields. With a staff of more than 200 workers in the home office alone, at 39 Russell Street, Rochester, Will Corporation has gone far beyond even the most sanguine dreams of its founder. This brief survey has been made possible through the cooperation of one of their top men, and a friend of many years, Ray J. Bott, and by use of material from Rochester *Commerce*.

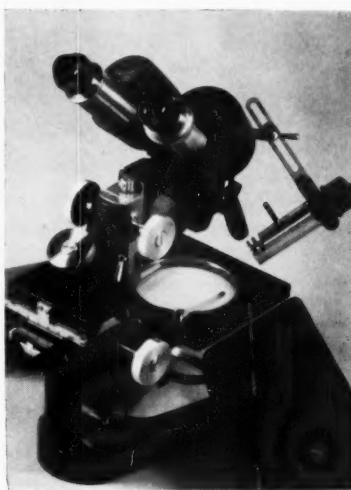
#### NEWS NOTE

A former member of the American Society of Amateur Microscopists is now a dealer in laboratory apparatus, including microscopes. He is Wallace Dean Rogers, 6112 Lorca Drive, San Diego 15, California.

## Family Album

### 11. Wide-Field Binocular Microscope

THE TYPE of instrument illustrated has been figured and described many times in these columns. It has a variety of names, none completely standardized as yet. Some call it a wide-field binocular microscope, or a wide-field dissecting microscope; others a stereoscopic microscope. Optically it is a binocular-binocular instrument, with a completely doubled optical system,



The Reichert wide-field binocular microscope.

and since each eye views a separate image of the object, a stereoscopic effect is achieved when the two eyepieces are so spaced as to yield a single fusion image.

Necessarily, such a microscope is more expensive than the monocular-monocular type. The two do not compete; they are designed for looking at different classes of materials, and supplement one another. The binocular is for whole objects, as dissections, small skulls, insects, parasites, embryos, plants, minerals, fossils, stamps; the monocular primarily for smears and sections. The ranges of magnifications in the binocular run much lower than in its cousin, from 2X to 40X, with 20X generally considered the most desirable for average usage.

The majority are equipped with some form of objective changer, equivalent to the nosepiece of the monocular instrument. Some revolve vertically, some horizontally, and others shift back and forth in the same plane. Additional paired eyepieces increase the number

of available magnifications. The eyepiece housings, with Porro prisms, work on the same principle as those of a pair of prism binoculars as used for bird study or at the race track. However, the two images are moved farther apart rather than brought closer together.

Some models are equipped with a substage, to provide a mirror below; others dispense with this feature, the stage resting directly upon the table. The one pictured here is a late product of Reichert, of Vienna, and is shown in use with a lamp attached for viewing objects by incident (reflected) light, as well as a mirror for transmitted illumination. There are spring clips and hand rests. For further information about this model write the American agent, William J. Hacker & Co., Inc., 82 Beaver St., New York 5.

## Book Reviews

*Principles of Zoology*, by John A. Moore, Barnard College and Columbia University. Oxford University Press, 114 Fifth Ave., New York 11, 1957. \$7.50. Pp. xiv, 667, figs. 217.

A completely new and different book, radically unlike most of those previously reviewed. By far the most stimulating text on the subject we have seen; student is presented with a real intellectual challenge. The six parts, each with a prospectus, introduce modern areas of active biological research on an historical basis. Example: Part B, The Development of Genetic Concepts, begins with the account of Darwin's pan-genesis, then develops the cell principle, mitosis, meiosis, fertilization, with the work of Mendel, Boveri, Sutton, Morgan, and many others to the present day. Step by step, the great discoveries in this field are explored and their significance discussed. Reader is persuaded to see the problem as each of these men, in turn, saw it. Other parts deal with the frog as a biological system, embryology's rise to present experimental status, evolution of chordates, a thorough human physiology, and a final short section on the philosophy of science.

It becomes evident as one reads that the author is unsurpassed as a master of his subject and also as an explainer. Stage by stage the more difficult matter is unfolded in a logical manner that makes everything clear, and in a style that is at once superb in its simplicity and yet

entertaining in its charm and variety. One can read for hours without a lag in interest. It is a book to be read, like a novel, not merely consulted as a reference. The illustrations are almost entirely new; the drawings are simplified to the point of mere outline, yet get their message across admirably. Much is omitted that other texts include, but those topics

that are included are carried through with masterly presentation of full detail. This is a book of limited breadth but of great depth. Especially to be recommended for honors courses and wherever thoroughness is stressed. Teachers of animal biology should give this one a long and a hard look before making adoption decisions.

*General Zoology*, by David F. Miller and James G. Haub, Ohio State University. Henry Holt & Co., 383 Madison Ave., New York 17, 1956. Pp. viii, 550; figs. 382. \$6.95.

Modern format, well printed, set two columns per page, with wealth of fine illustrations, although some drawings are not up to par. Organization: four sections—descriptive zoology; ecology; reproduction, heredity, and evolution; physiology. Considerable repetition and cross-referencing needed to hold these together. Level of writing more suited to high school than to college; oversimplified. Illustrations often not sufficiently explained nor integrated with text. Phylogeny not considered; arrangement classical (e.g., echinoderms not placed with chordates); description of groups mostly brief; best part is comparative physiology.

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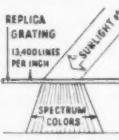
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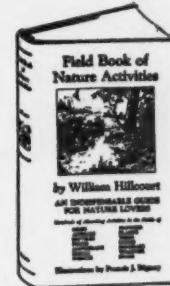
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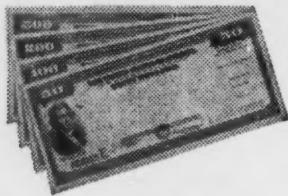
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